GE Medical Systems

Technical Publications

Direction 2259724-100
Revision 11

Proteus XR/a Operator Manual

CE 0459

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By General Electric Company
Operating Documentation

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IMPORTANT!...X-RAY PROTECTION

X-ray equipment if not properly used may cause injury. Accordingly, the instructions herein contained should be thoroughly read and understood by everyone who will use the equipment before you attempt to place this equipment in operation. The General Electric Company, Medical Systems Group, will be glad to assist and cooperate in placing this equipment in use.

Although this apparatus incorporates a high degree of protection against x-radiation other than the useful beam, no practical design of equipment can provide complete protection. Nor can any practical design compel the operator to take adequate precautions to prevent the possibility of any persons carelessly exposing themselves or others to radiation.

It is important that everyone having anything to do with x-radiation be properly trained and fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements as published in NCRP Reports available from NCRP Publications, 7910 Woodmont Avenue, Room 1016, Bethesda, Maryland 20814, and of the International Commission on Radiation Protection, and take adequate steps to protect against injury.

The equipment is sold with the understanding that the General Electric Medical Systems, its agents, and representatives have no responsibility for injury or damage which may result from improper use of the equipment.
Various protective material and devices are available. It is urged that such materials or devices be used.

CAUTION

United States Federal law restricts this device to be used by or on the order of a physician.

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If you have any comments, suggestions or corrections to the information in this document, please write them down, include the document title and document number, and send them to:
GENERAL ELECTRIC MEDICAL SYSTEMS
MANAGER - INFORMATION INTEGRATION
AMERICAS, X-RAY W-622
P.O. BOX 414
MILWAUKEE, WI 53201-0414

CERTIFIED ELECTRICAL CONTRACTOR STATEMENT

All electrical installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. In addition, electrical feeds into the Power Distribution Unit shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations, and testing shall be performed by qualified GE Medical personnel. The products involved (and the accompanying electrical installations) are highly sophisticated, and special engineering competence is required. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE's electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE's field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

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REGULATORY REQUIREMENTS

This product complies with the regulatory requirements of the following:

- Council Directive 93/42/EEC concerning medical devices: the CE label affixed to the product testifies compliance to the Directive.

  The location of the CE label on the product is described page 2-4.

  European registered place of business:

  GE Medical System Europe
  Quality Assurance and Safety Regulatory Manager
  BP 34
  F 78533 BUC CEDEX FRANCED
  Tel: +33 (0) 1 30 70 40 40

- Green QSD 1990 Standard issued by MDD (Medical Devices Directorate, Department of Health, UK).
- Quality System Regulation issued by the FDA (Food and Drug Administration, Department of Health, USA).
- Underwriter's Laboratories, Inc. (UL), an independent testing laboratory.
- Canadian Standards Association (CSA).
- International Electrotechnical Commission (IEC).

The following equipment classifications are applicable to the product:

- Equipment classification with respect to protection from electric shock: **Class 1**
- Degree of protection from electric shock: **Type B**
- Degree of protection against ingress of liquids: **not classified**
- Equipment not suitable for use in the presence of a flammable anaesthetic mixture with air or with nitrous oxide; mode of operation: **continuous**
- Mode of operation: **continuous with intermittant loading**
- The Proteus XRa has only **level 1** EMC susceptability immunity responses.

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ELECTROMAGNETIC COMPATIBILITY (EMC)

This product conforms with IEC 60601-1-2:2001 EMC standard for medical devices.

Note: This equipment generates, uses, and can radiate radio frequency energy. The equipment may cause or subject to radio frequency interference with other medical and non–medical devices and radio communications. To provide reasonable protection against such interference, the Proteus XR/a System (32, 50, 65, 80kW) complies with emissions limits for a Group 1, Class A Medical Devices and has applicable immunity level as stated in EN 60601-1-2:2001.

However, there is no guarantee that interference will not occur in a particular installation. Special precautions and other information regarding EMC provided in the accompanying documents of this equipment shall be observed during installation and operation of this equipment.

Note: If this equipment is found to cause interference (which may be determined by switching the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

- Reorient or relocate the affected device(s).
- Increase the separating space between the equipment and the affected device.
- Power the equipment from a source different from that of the affected device.
- Consult the point of purchase or service representative for further suggestions.

WARNING Use of accessories, transducers, cables and other parts other than those specified by the manufacturer of this equipment may result in increased emissions or decreased immunity of the equipment. The manufacturer is not responsible for any interference caused either by the use of interconnect cables other than those recommended, or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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ELECTROMAGNETIC COMPATIBILITY (EMC) (CONT.)

Note: To comply with the regulations applicable to an electromagnetic interface for a Group 1, Class A Medical Device, and to minimize interference risks, the following requirements shall apply:

- All interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference in violation of the European Union Medical Device directive and FCC regulations.
- All of those recommended guidance regarding electromagnetic environment should be followed.

Note: Do not use devices that intentionally transmit RF signals (Cellular Phones, Transceivers, or Radio Controlled Products) in the vicinity of this equipment as it may cause performance outside the published specifications. Keep the power to these type devices turned off when near the equipment. The medical staff in charge of this equipment is required to instruct technicians, patients, and others.

Guidance and manufacturer's declaration – Electromagnetic Emissions

The **Proteus XR/a system** is suitable for use in the specified electromagnetic environment. The purchaser or user of the **Proteus XR/a system** should assure that it is used in an electromagnetic environment as described below:

Emissions Test	Compliance	Electromagnetic Environment
RF Emissions CISPR11	Group1	The Proteus XR/a system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR11	Class A	The Proteus XR/a system is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Not applicable	

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ELECTROMAGNETIC COMPATIBILITY (EMC) (CONT.)

Guidance and manufacturer's declaration - Electromagnetic Immunity (1)

The **Proteus XR/a system** is suitable for use in the specified electromagnetic environment. The purchaser or user of the **Proteus XR/a system** should assure that it is used in an electromagnetic environment as described below:

Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors are wood, concrete, or ceramic tile, or floors are covered with synthetic material and the relative humidity is at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality is that of a typical commercial and/or hospital environment
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality is that of a typical commercial and/or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5 % U_T (> 95 % dip in U_T) for 0.5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) < 5 % U_T (> 95 % dip in U_T) for 5 s	0 % U_T for 5 sec	Mains power quality is that of a typical commercial and/or hospital environment. If the user of the Proteus XR/a system requires continued operation during power mains interruptions, it is recommended that the Proteus XR/a system be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields are at levels characteristic of a typical location in a typical commercial and/or hospital environment.

Note: These are guidelines. Actual conditions may vary.

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ELECTROMAGNETIC COMPATIBILITY (EMC) (CONT.)

Guidance and manufacturer's declaration - Electromagnetic Immunity (2)

The **Proteus XR/a system** is suitable for use in the specified electromagnetic environment. The purchaser or user of the **Proteus XR/a system** should assure that it is used in an electromagnetic environment as described below:

Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment
Conducted RF IEC 61000-4-6	3 V 150 kHz to 80 MHz	[$V_{1\ =}$] 3 V	Portable and mobile RF communications equipment are used no closer to any part of the [EQUIPMENT and/or SYSTEM], including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter. **Recommended separation distance** $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2,5 GHz **Note:** P is the power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,* are less than the compliance level in each frequency range.** Interference may occur in the vicinity of equipment marked with the following symbol:
Radiated RF IEC 61000-4-3	3 V/m 80 kHz to 800 MHz	[$E_{1=}$] 3 V/m	

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

*Field strengths from fixed transmitters, such as base stations for cellular telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast cannot be estimated accurately. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be performed. If the measured field strength exceeds the RF compliance level above, observe the **Proteus XR/a system** to verify normal operation in each use location. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the [EQUIPMENT and/or SYSTEM].
**Over the frequency range 150 kHz to 80 MHz, field strengths are less than 3 V/m.
The Recommended Separation Distances are listed in the next table.
Note: These are guidelines. Actual conditions may vary.

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ELECTROMAGNETIC COMPATIBILITY (EMC) (CONT.)

Recommended Separation Distances for Portable and Mobile RF Communications Equipment and the **Proteus XR/a system**

Frequency of Transmitter	**150KHz to 80 MHz**	**80 MHz to 800 MHz**	**800 MHz to 2,5 GHz**
Equation	$d = 1.2\sqrt{P}$	$d = 1.2\sqrt{P}$	$d = 2.3\sqrt{P}$
Rated Power of Transmitter (W)	**DISTANCE (meters)**	**DISTANCE (meters)**	**DISTANCE (meters)**
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a power not listed above, the **DISTANCE** can be estimated using the equation in the corresponding column, where P is the power rating of the transmitter in watts (W) according to the transmitter manufacturer.

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SAFETY

WARNING

ELECTRIC SHOCK HAZARD! DO NOT REMOVE COVERS OR PANELS. GENERATOR CABINET CONTAINS HIGH VOLTAGE CIRCUITS FOR GENERATING AND CONTROLLING X-RAYS. PREVENT POSSIBLE ELECTRIC SHOCK BY LEAVING COVERS AND PANELS ON THE EQUIPMENT. THERE ARE NO OPERATOR SERVICEABLE PARTS OR ADJUSTMENTS INSIDE THE CABINETS UNDER THE TABLE. ONLY TRAINED AND QUALIFIED PERSONNEL SHOULD BE PERMITTED ACCESS TO THE INTERNAL PARTS OF THIS EQUIPMENT.

WARNING

FOR CONTINUED SAFE USE OF THIS EQUIPMENT, FOLLOW THE INSTRUCTIONS CONTAINED IN THIS OPERATING MANUAL. STUDY THIS MANUAL CAREFULLY BEFORE USING THE EQUIPMENT AND KEEP IT AT HAND FOR QUICK REFERENCE.

WARNING

RADIOGRAPHIC EQUIPMENT MUST BE OPERATED BY QUALIFIED PERSONNEL AND ONLY AFTER SUFFICIENT TRAINING.

WARNING

UNITED STATES FEDERAL LAW RESTRICTS THIS DEVICE TO USE BY OR ON THE ORDER OF A PHYSICIAN.

WARNING

IT IS THE RESPONSIBILITY OF THE OPERATOR TO ENSURE THE SAFETY OF THE PATIENT WHILE THE MACHINE IS IN OPERATION BY CHECKING PROPER PATIENT POSITIONING AND USING THE EQUIPMENT PROTECTIVE DEVICES.

WARNING

TO AVOID INJURY TO FINGERS AND HANDS OF PATIENT AND OPERATOR CAUSED BY TABLE TOP MOVEMENT, HANDS MUST BE KEPT AWAY FROM TABLE TOP EDGES AT ALL TIMES.

WARNING

USE A SID AS LARGE AS POSSIBLE IN ORDER TO KEEP THE ABSORBED DOSE TO THE PATIENT AS LOW AS REASONABLY ACHIEVABLE.

WARNING

IT IS THE RESPONSIBILITY OF THE OPERATOR TO PROVIDE MEANS FOR AUDIO AND VISUAL COMMUNICATION WITH THE PATIENT FROM THE CONTROL ROOM.

WARNING

PERFORM PERIODIC MAINTENANCE TO ENSURE CONTINUED SAFE USE OF THE EQUIPMENT. ***(See chapter 11 Planned Maintenance).***

WARNING

IF ANY SAFETY PROBLEM OCCURS, PLEASE STOP USING THIS DEVICE AND CONTACT OUR SERVICE AT ONCE.

CAUTION

Always be alert to safety when you operate this equipment. You must be familiar enough with the equipment to recognize any malfunctions that can be a hazard. If a malfunction occurs or a safety problem is known to exist, do not use this equipment until qualified personnel correct the problem.

CAUTION

Apply necessary sterilization with 75% medical Alcohol to components which are possible to be contacted with the patients, such as Table top, Wall Stand (including SG120 Wall Stand) front panel, etc.

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ESTABLISH EMERGENCY PROCEDURES

ESTABLISH PROCEDURES FOR HANDLING THE PATIENT IN CASE OF THE LOSS OF RADIOGRAPHIC IMAGING OR OTHER SYSTEM FUNCTIONS DURING AN EXAM.

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POSSIBLE PATIENT INJURY!

TO AVOID POSSIBLE PATIENT INJURY, BE SURE THAT SYSTEM POWER IS APPLIED BEFORE THE PATIENT ENTERS THE ROOM. THE OVER HEAD TUBE SUSPENSION MOVEMENT EM LOCKS AND TABLE LONGITUDINAL TRAVEL LOCKS FUNCTION ONLY WHEN SYSTEM AC POWER IS APPLIED.

IF POWER IS DISCONNECTED, THE OTS AND THE TABLE TOP (LONGITUDINAL) WILL MOVE FREELY, POSSIBLE CAUSING THE PATIENT TO FALL.

- **DO NOT ALLOW THE PATIENT TO MOUNT OR DEMOUNT THE SYSTEM.**
- **DO NOT ALLOW THE PATIENT TO USE THE OTS AS A SUPPORT.**

OPERATIONAL CHECKS

Be sure the equipment is functioning properly and safely before each examination:

Verify that the following controls are operating correctly:

- Motion controls, and Lock Releases
- Audible and visual alarms

Visually inspect the equipment and make sure that:

- Equipment is not damaged or missing parts
- All cover panels are in place prior to turning on electrical power (hazardous electrical or mechanical parts could be exposed).

APPROVED OPERATING PROCEDURES AND ACCESSORIES

Be sure to use the equipment and the approved accessories according to approved operating procedures:

- Perform X-ray tube warm up procedure prior to the exam. Failure to perform this procedure could damage the X-ray Tube assembly.
- Do not exceed tabletop rating of a 220 kg (484 lbs.) patient. Excessive loading could damage the tabletop and/or cause the patient to fall.
- Accessories should be properly attached to the table and positioned so as not to interfere with system motions.
- Avoid unnecessary exposure to radiation. Stay behind the lead glass radiation shield or lead screen. When in unshielded areas, wear protective apparel such as goggles, lead aprons, and gloves.

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PLANNED MAINTENANCE

WARNING

POSSIBLE PATIENT OR OPERATOR INJURY!

TO AVOID POSSIBLE PATIENT OR OPERATOR INJURY, BE SURE TO PERFORM THE PERIODIC INSPECTIONS AND MAINTENANCE PROVIDED IN THIS DOCUMENT. FAILURE TO PERFORM THESE INSPECTIONS COULD ALLOW DETERIORATING CONDITIONS TO DEVELOP WITHOUT BEING DETECTED. THIS DETERIORATION COULD RESULT IN EQUIPMENT FAILURES WHICH COULD CAUSE SERIOUS INJURY EQUIPMENT DAMAGE.

RADIATION SAFETY

Always use proper technique factors for each procedure to minimize x-ray exposure and to produce the best diagnostic results. In particular, you must be thoroughly familiar with safety precautions before operating this System.

It is not always possible to determine when some components, such as x-ray tubes, are nearing the end of their operating lives. These components could stop operating during a patient examination.

KNOW THE EQUIPMENT

Read and understand all the instructions in the operating manuals before attempting to use the product and request training assistance from GE Medical System if needed.

Keep the operating manuals with the equipment at all times and periodically review the procedures and safety precautions.

This system contains operating safeguards to provide maximum safety. Before calling for service, be certain proper operating procedures are being used.

Satisfactory equipment performance requires the use of service personnel specially trained on x-ray apparatus. GE Medical Systems is responsible for the effects on safety, reliability, and performance only if the following conditions are met:

- The electrical wiring of the relevant rooms complies with all national and local codes as well as the *Regulations for the electrical equipment of buildings* published by the Institution of Electrical Engineers.
- All assembly operations, extensions, re-adjustments, and modifications or repairs are carried out by GE Medical Systems' authorized service representatives.
- The equipment is used in accordance with the instructions for use.

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REVISION HISTORY

REV	DATE	TYPE OF MODIFICATION
0	10/01/2000	Initial production Release
1	20/07/2000	Add system function description and system specification
2	05/12/2000	Update OTS user's interface description
3	01/02/2001	Update the regulatory requirements.
3	01/02/2001	Add a warning to wall stand operators.
3	01/02/2001	Update system labeling.
3	01/02/2001	Add printer information.
3	01/02/2001	Update wall stand illustration.
3	15/02/2001	Add notes.
3	19/02/2001	Add new wall stand.
3	19/02/2001	Add a maintenance item.
3	01/03/2001	Add manufacturer's name
3	07/03/2001	Add a warning.
4	27/09/2001	Add notes, change specs.
5	14/05/2003	Add description of MX100 X-ray tube and SG100 Wall Stand
6	12/04/2004	Add a caution about the shroud of the elevating table.
7	25/06/2005	Add EMC and WEEE Rules.
7	25/06/2005	Add description of SG120 Wall Stand.
8	05/12/2005	Add description of Eclipse Proteus collimator
8	05/12/2005	Add a warning
9	15/02/2006	Add description of Reciprocating Bucky and AID Ion Chamber.
10	20/06/2006	Update warning label to meet HHS requirements in Chapter 2.
11	08/10/2006	Add mA and mAs

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chapter12 thru chapter13	4		
2-4	5		
3-1 thru 3-3	5		
5-13	5		
6-5	5		
6-8	5		
7-5 and 7-7	5		
8-1	5		
8-2	5		
chapter 9	5		
10-3	5		
11-4	5		
13-1 thru 13-2	5		
14-9	5		
APPENDIX	5		

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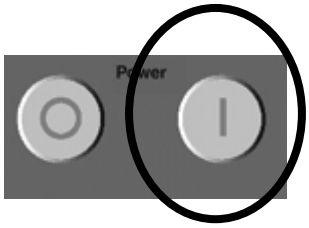
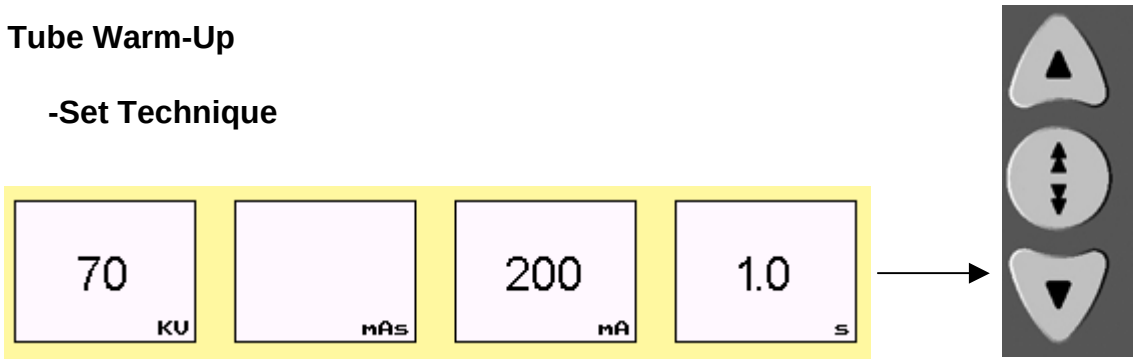
CHAPTER 1 PROTEUS XR/A QUICK START

1-1 Turn System On

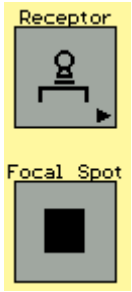


1-2 Tube Warm-Up

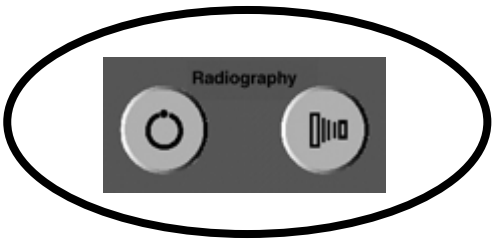
-Set Technique



-Set Parameters



-Take 2 Exposures 10 sec apart



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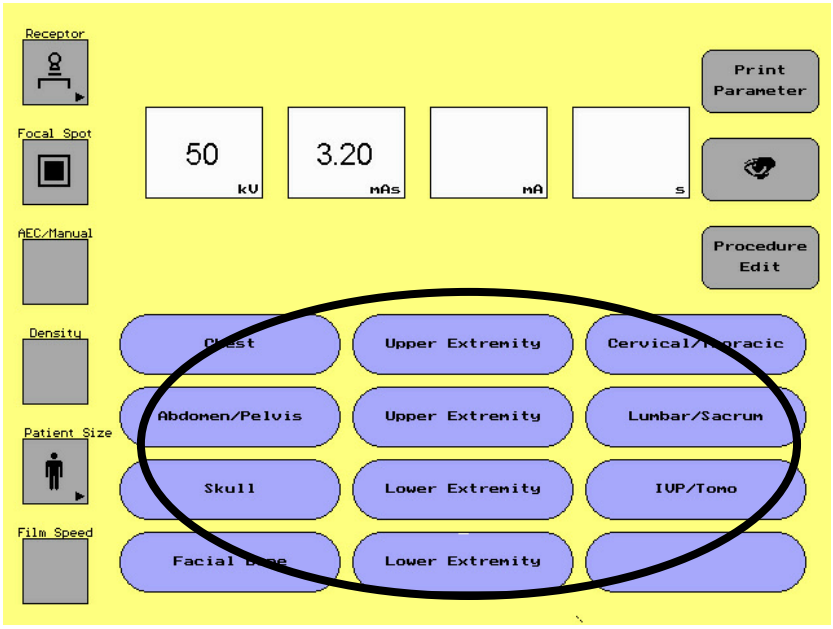
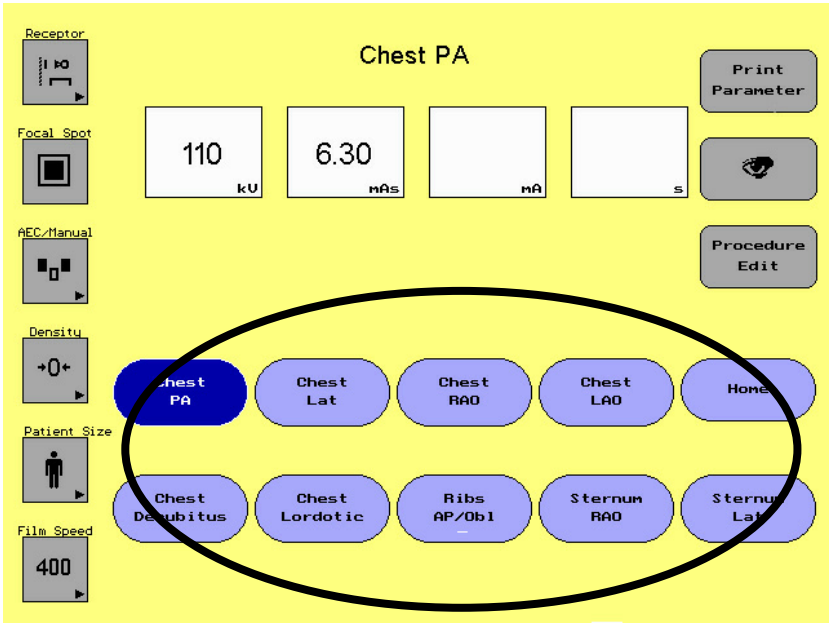
1-3 Set Technique APR

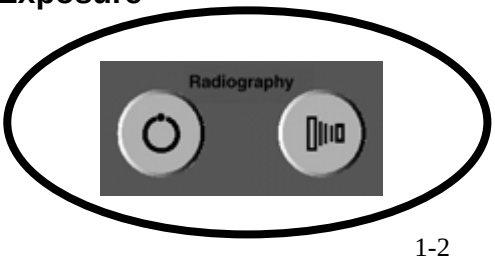
-Select Category



-Select Procedure



-Take Exposure



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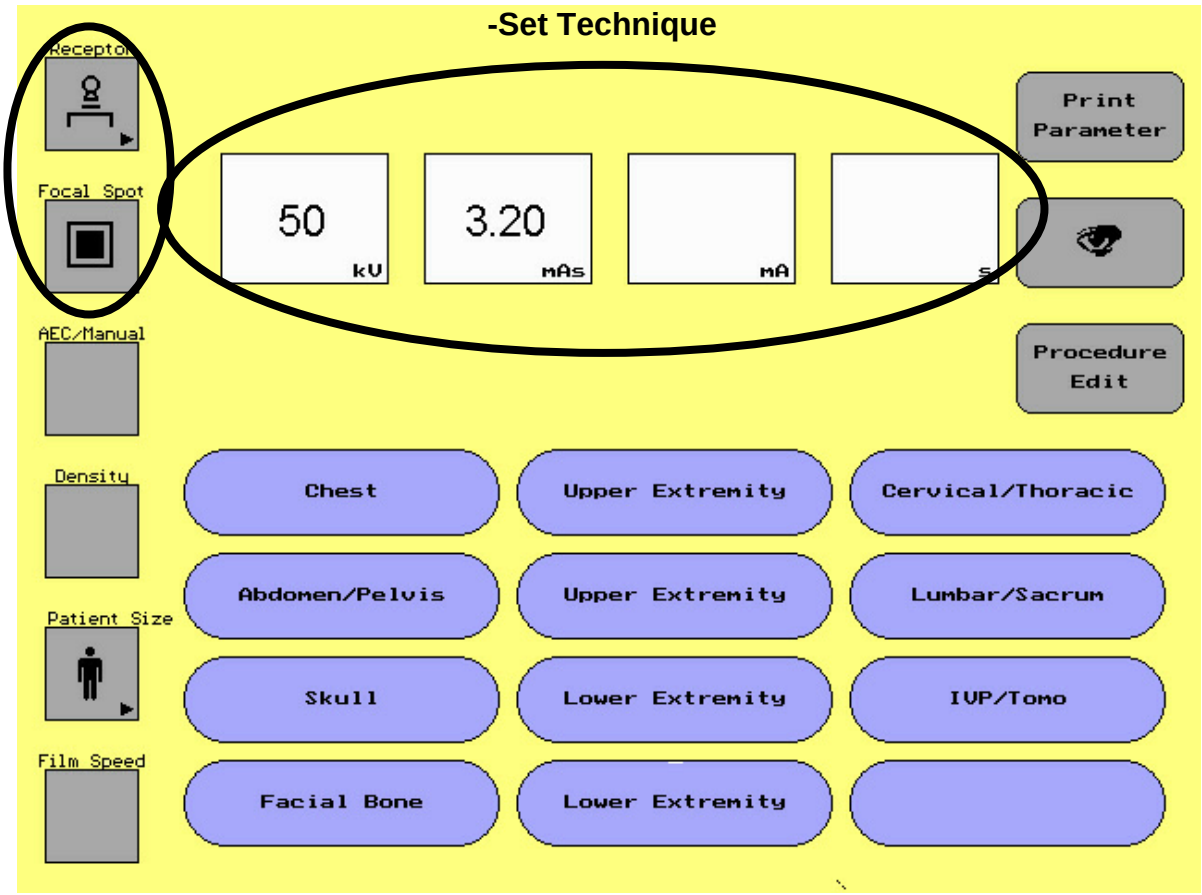
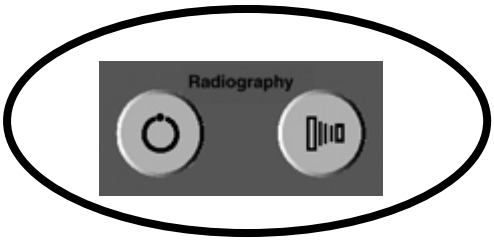
1-4 Set Manual Technique

-Set Parameters



-Take Exposure



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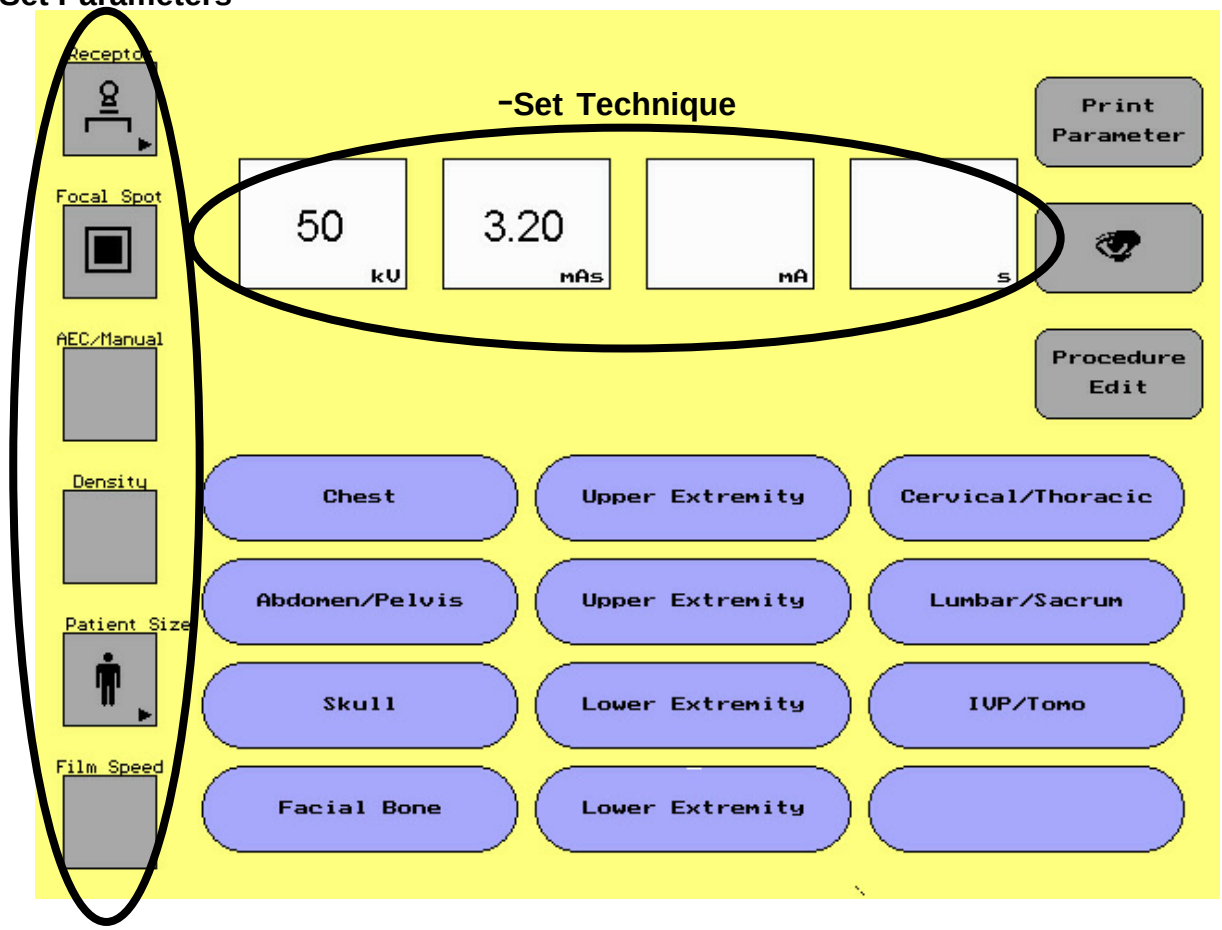
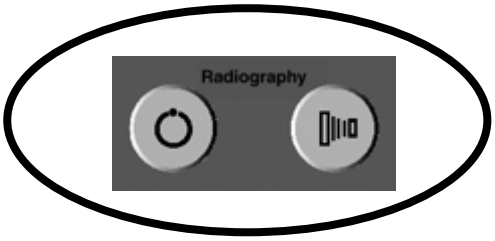
1-5 Set AEC Technique

-Set Parameters



-Take Exposure



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CHAPTER 2 SYMBOLS

Symbols used on this system and in its accompanying documents are shown and explained in this section.

2-1 Special Notices

Caution advises of an avoidable condition that could cause minor physical injury, or damage to equipment or data.

Warning advises of an avoidable condition that may allow or cause a personal injury or the catastrophic destruction of equipment or data.

Danger advises of an avoidable condition that will cause serious or fatal injury.

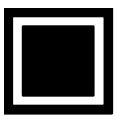
Dangerous Voltage. Indicates an avoidable dangerous high voltage hazard.

This symbol on the equipment means that the operating instructions should be consulted to assure safe operation.

This symbol indicates that waste electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment

2-2 X-ray Tube

X-ray emission. X-ray tube head is emitting X-rays. Take adequate precautions to prevent the possibility of any persons carelessly, unwisely, or unknowingly exposing themselves or others to radiation.



Identifies controls or indicators associated with the selection of a small focal spot or the connection for the corresponding filament.

Identifies controls or indicators associated with the selection of a large focal spot or the connection for the corresponding filament.

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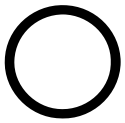
2-3 Power ON and OFF

Power ON switch or switch position that applies mains voltage. Indicated connection to the mains for all mains switches or their positions. This symbol is used in all cases where safety is involved.



Power OFF switch or switch positions that removes mains voltage. Indicated disconnection from the mains for all mains switches or their positions. This symbol is used in all cases where safety is involved.

2-4 Electrical Type

Type B Equipment. Equipment providing a particular degree of protection again electrical shock regarding leakage current and protective grounding per IEC 601-1.

2-5 Electrical Current

Alternating Current. Indicates equipment that is suitable for alternating current only.

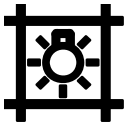
Direct Current. Indicates equipment that is suitable for direct current only.

2-6 Ground

Functional Earth (ground) Terminal. Terminal directly connected to a point of a measuring supply or control circuit or to a screening part which is intended to be earthen for functional purposes.

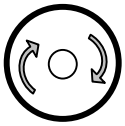
Protective Earth (ground). Identifies any terminal that is intended for connection of an external protective conductor **to protect against electrical shock** in case of a fault.

2-7 Proteus XR/a Collimator / Eclipse Proteus Collimator



Control for indicating radiation field by using light.

2-8 Emergency Button



Immediately removes power from table.

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2-9 Warning Signs and Labels

CDRH(USA)

WARNING
THIS X-RAY UNIT MAY BE DANGEROUS TO PATIENT AND
OPERATOR UNLESS SAFE EXPOSURE FACTORS, OPERATING
INSTRUCTIONS AND MAINTENANCE SCHEDULES ARE OBSERVED

REDACT (CANADA)

CAUTION X-RAY
ATTENTION RAYONS X
USE OF THIS EQUIPMENT IS FORBIDDEN TO UNAUTHORIZED
PERSONS L UTILISATION DE CET APPAREIL EST INTERDITE POUR
TOUTE PERSONNE NON AUTORISEE

IEC(EUROPE)

CHINA

Laser Warning

Proteus XR/a Collimator

Eclipse Proteus Collimator

Note: ***If have, please confirm the collimator and wall stand you've chosen by referring to the next chapter.***

Table 2-1
MEANINGS OF PROTEUS XR/A SIGNS

SYMBOL	DESCRIPTION
	X-RAY EMISSION
	GROUND
	CAUSION: REFER TO ACCOMPANYING DOCUMENTS

SYMBOL	DESCRIPTION
	TYPE B EQUIPMENT
	HIGH VOLTAGE

Illustration 2-1
PROTEUS XR/A SYSTEM WARNING SIGNS LOCATION

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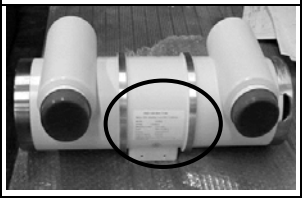
2-10 System Labelling

The labels for the Proteus XR/a system are found on the side panel of the Proteus XR/a cabinet. This label includes the CE mark for the entire system. See the following sketch.
For other name plate location, see table 2-2.

Table 2-2
PROTEUS XR/a SYSTEM IDENTIFICATION AND COMPLIANCE PLATES

DESIGNATION	System console	Wall Stand	OTS radiographic suspension (2/3 m)	Cabinet
PART NUMBER	2259976	2260354	S3918MD/S3918K	2259973
LOCATION of Name Plate				

DESIGNATION	X-ray Tube (RAD-14)	Proteus XR/a Automatic Collimator	Bucky (L/H)	Jedi Generator
PART NUMBER	2259981	2259298-54	2189553 or 5159516-1	2268970 or 2244165-2
LOCATION of Name Plate				

DESIGNATION	X-ray Tube (MX 100)	Eclipse Proteus Collimator	SG120 Wall Stand
PART NUMBER	D2301R	2379827	2402562
LOCATION of Name Plate			

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CHAPTER 3 SYSTEM DESCRIPTION

The Proteus XR/a X-ray System is a general radiographic system designed for a wide ra-nge of table, wall stand, wheelchair, and stretcher examinations. The system is especially suited for general-purpose radiography in hospitals, clinics, and private practices.

Note: ***Please confirm the collimator you've chosen by referring to the following contents.***

Note: ***If have, please confirm the wall stand you've chosen by referring to the following contents.***

3-1 System Components/Features

The basic Proteus XR/a System consists of:

1 Generator Cabinet
- 32, 50 kW, 50 kHz High Frequency Generator
- 65, 80 kW, 50 kHz High Frequency Generator (optional)

2 System console
- Color LCD Touch Screen

3 OverHead Tube Suspension (OTS)
- Control Console
- Receptor Selection
- kV/mAs Adjustments
- SID Display
- Angle Display

4 Table (optional)
- Elevating Table
- Bucky
- Fixed Grid Cassette Holder (optional)
- Ion Chamber for AEC (optional)

5 Wall Stand (GPCP No.: 2260354) (optional)
- Bucky
- Stationary Grid (optional)
- Ion Chamber for AEC (optional)

6 SG120 Wall Stand (GPCP No.: 2402562) (optional)
- Revolvable Bucky
- Vibrating Grid (optional)
- Ion Chamber for AEC (optional)

7 Proteus XR/a Collimator
- Automatic
- Manual(optional)

8 Eclipse Proteus Collimator

9 X-ray Tube
- VARIAN Rad14 High Speed - 0.6/1.2 mm Focal Spot (32, 50 kW systems)
- KOUSHAL MX100 High Speed - 0.6/1.25 mm Focal Spot (65, 80 kW systems)

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10 Tomolink (optional)
- Tomolink System Console
- Control Electronics Wall Box
- Table/OTS Coupling Hardware
- OTS Drive

11 Printer (optional)

WARNING

ANY OPTIONAL AND REPLACED COMPONENTS SHOULD BE COMPATIBLE WITH THE SYSTEM AND BE AUTHORIZED BY GE COMPANY, OTHERWISE THEREOF THE LOSS OR DAMAGE IS NOT THE RESPONSIBILITY OF GE COMPANY.

ILLUSTRATION 3-1
PROTEUS XR/A SYSTEM COMPONENTS

The Proteus XR/a System is divided into basic components:

1. System Console
2. Elevating Table
3. Overhead Tube Suspension
4. Wall Stand (GPCP No.: 2260354) (optional)
5. SG120 Wall Stand (GPCP No.: 2402562) (optional)
6. Generator Cabinet
7. X-ray Tube
8. Proteus XR/a Collimator
9. Eclipse Proteus Collimator
10. Tomography (optional)
11. Printer (optional)

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3-2 HHS Compliance Compatibilities

The purpose of this table is to provide users and installers, the ability to verify that all the HHS Certified Components of this system are compatible.

Purpose

Installers must indicate that the combination of installed HHS Certified Components is compatible on Form F3382 provided in Direction 46-013894, *System Field-Test For HHS*.

TABLE 3-1
PROTEUS XR/A SYSTEM HHS COMPLIANCE COMPATIBILITY LIST

PRODUCT CATEGORY	PRODUCT DESCRIPTION	MODEL NUMBER
RADIOGRAPHIC TABLE	PROTEUS TABLE	2259988
VERTICAL CASSETTE HOLDER	WALL STAND	600-0301
	SG120 TILTING / ROTATING WALL STAND	2402562
BEAM LIMITING DEVICE	PROTEUS XR/A MANUAL COLLIMATOR	2259989
	PROTEUS XR/A AUTO COLLIMATOR	2259298-54
	ECLIPSE PROTEUS COLLIMATOR	2379827
XRAY TUBE HOUSING ASSEMBLY	RAD 14, 32/50KW	2259981
	MX 100, 65/80KW	D2301R
XRAY CONTROL	SYSTEM CONSOLE	2259976
HIGH VOLTAGE GENERATOR	JEDI 80R 1T	2268970

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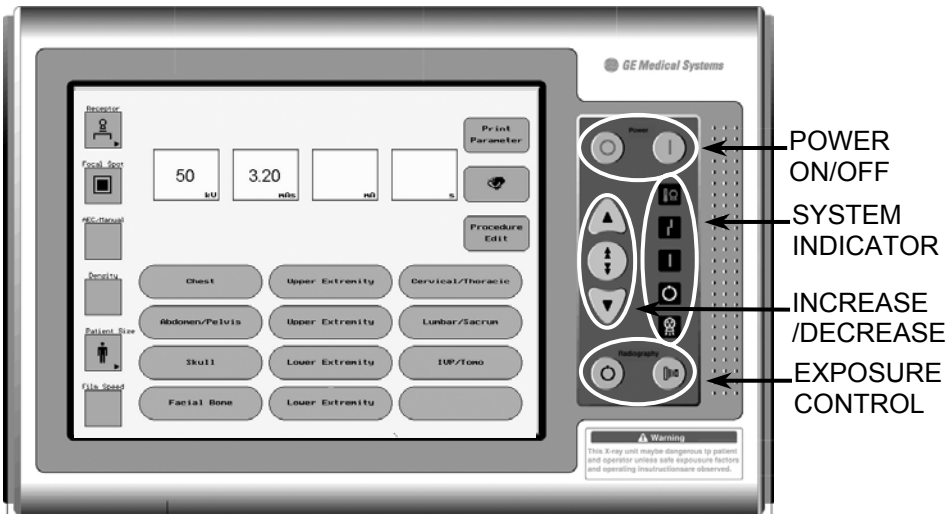
CHAPTER 4 PROTEUS XR/A SYSTEM START UP AND SHUT DOWN

Illustration 4-1
SYSTEM CONTROL PANEL



4-1 Turn the power on

Illustration 4-2
SYSTEM POWER ON/OFF

To turn ON the generator, press the “power on ” button located on the right side of the control console.

When the generator is on the color touch screen will appear.

Also on the status display area (|) will light up indicating the system power is on. All other equipment in the room will simultaneously turn on.(Table, OTS, x-ray system equipment etc.)

4-2 Turn Power off

To turn OFF the generator, press the “power off” located on the right side of the control console. All other equipment in the room will turn off.

When the power is turned off, the color touch screen will disappear. Also the indicator in the system display area will not be lit.

CAUTION

Do not turn the power ON and OFF quickly. Wait at least 30 seconds between switching from ON / OFF and vice versa.

WARNING

IN EMERGENCY, USE “EMERGENCY OFF” SWITCH LOCATED ON THE WALL NEXT TO THE CONTROL CONSOLE.

CAUTION

Except in emergency, do not turn the generator off until the “ READY” indicator on the status display is extinguished. Turning off the generator before this stage then will cause undue stress on the X-ray tube.

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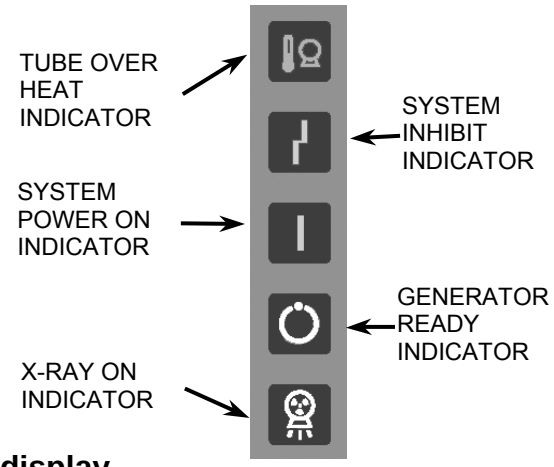
4-3 Daily Warm Up Procedures

A tube warm up is recommended every day before the system is used. A tube warm-up should also be completed if the system is inactive for more than 2 hours.

To maximize tube life, perform the following tube warm-up procedure:

1. The room should be free of a patient or personnel
2. Close collimator blades or block x-ray output.
3. Take 2 exposures (30 seconds apart) with the following technique Parameters:
   - Table top receptor
   - Large focal spot
   - 70 kV
   - 200 mA at 1 sec
4. Once exposures are taken the system is ready for use.

Illustration 4-3
System Status Display



4-4 System status display

The System Status Display is located on the control console under power On/Off buttons. Refer to Illustration 4-1. Within this display, there are five status indicators:

Tube Over Heat Indicator: If the Tube Over Heat Indicator light appears, the system has over heated. The system will not allow the user to take any exposures until the tube is properly cooled down.

System Inhibit Indicator: If the System Inhibit Indicator light appears, the system is indicating there is an error. This may indicate:

- Examination room door is open (indicator will flash)
- Various inhibition errors on the system (see Table 12-2)
- Technique overload (the parameter which is over the limit will flash)

System Power On Indicator: This indicator light appears when the system is turned on and stay on until the system is turned off.

Generator Ready Indicator: The Generator Ready Indicator appears during the prep for X-ray exposure.

X-ray ON Indicator: The X-ray ON Indicator appears indicating the generator is producing X-ray radiation.

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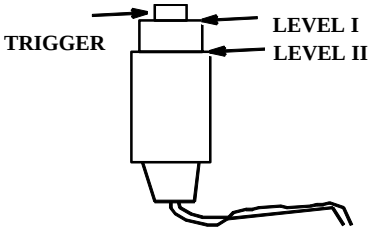
4-5 Radiography Control Key

ILLUSTRATION 4-4
HANDSWITCH



An exposure can be made using the handswitch that is connected to the System Console, or by using the exposure keys on the System Console.

Make an Exposure (Handswitch)

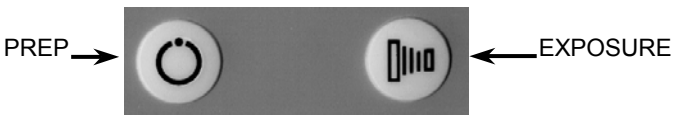
The handswitch is a three-position push button switch. Its three positions are OFF, Prep and Expose. The handswitch is normally in the OFF position. See Illustration 4-4.

Press the handswitch halfway to the Prep position for 1-1.5 seconds. This prepares the X-ray tube for exposure. Then press the handswitch all the way down to the Exposure position and hold until the exposure is complete. A beep will sound notifying that the exposure is complete.

WARNING

X-RAY EMISSION IS TERMINATED INSTANTLY WHEN YOU RELEASE THE HANDSWITCH PUSHBUTTON.

Illustration 4-5
ANODE START UP/EXPOSE



Make an Exposure (System Console)

On the lower right hand corner of the System Console under the system status display is where the Prep and Exposure buttons are located. See Illustration 4-1.

To make an exposure using the System Console, first press down and hold the **PREP** button for 1-1.5 seconds. This prepares the X-ray tube for exposure. Then press the **EXPOSURE** button down until the exposure is complete. A buzzer will sound notifying that the exposure is complete.

Note: ***When select TOMO while make exposure, make sure to press "PREP" and "EXPOSURE" button during the whole exposure process, that is, tube travel reverses at the sweep limit and returns to center in the end.***

WARNING

IF THE SYSTEM IS EQUIPPED WITH A TUBE FAN, IT IS IMPORTANT TO MAKE SURE THE FAN IS WORKING PROPERLY FOR HEAVY LOAD. WHEN THE TUBE FAN STOPS, PLEASE CALL SERVICE AS SOON AS POSSIBLE AND AVOID OVEREXPOSURE UNTIL THE TUBE FAN IS WORKING NORMALLY. OTHERWISE THE TUBE MAY BE OVERHEATED AND BROKEN.

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CHAPTER 5 PROTEUS XR/A SYSTEM CONSOLE

5-1 Introduction

This section introduces you to the Operator Console Display. A standard system screen is used as an example to acquaint you with the arrangement of screen information.

Beside the ON/OFF, and status display buttons described in the previous section, the console also has a prep/expose hand switch and prep exposure buttons. The console also has an indicator lamp for x-ray exposure. It is located on the status display bar.

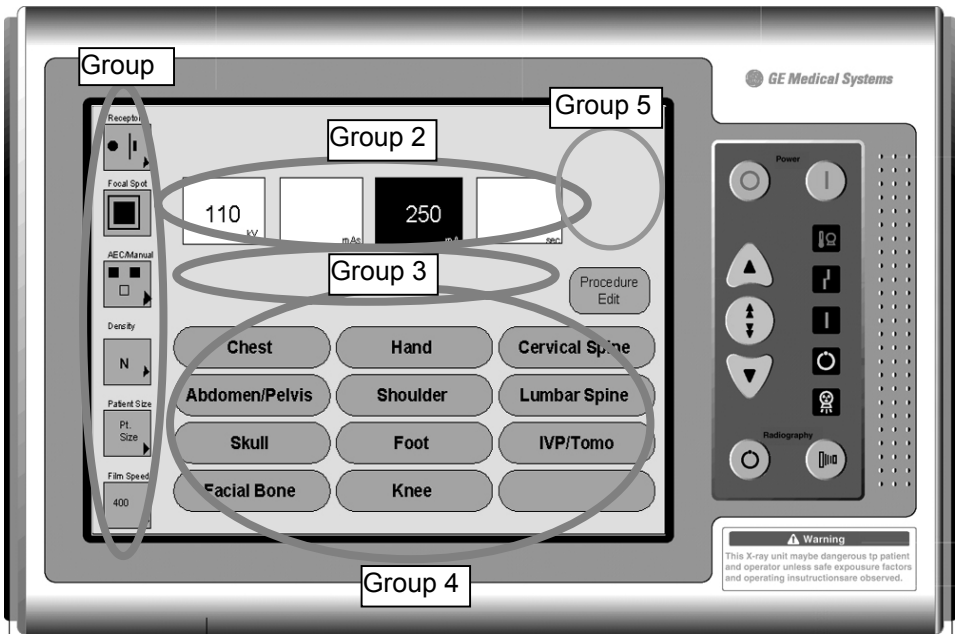
When there is an x-ray exposure the yellow x-ray exposure indicator lights and the console beeps. X-rays are produced when the x-ray prep/exposure buttons or hand switch are pressed.

On the outside of the display screen are a set of up/down arrows. These arrows are used to change the technique factors on the display screen. These buttons will be explained in the technique section.

WARNING

NEVER LOAD NON-SYSTEM SOFTWARE ONTO THE SYSTEM CONSOLE.

ILLUSTRATION 5-1
UNDERSTANDING THE DISPLAY



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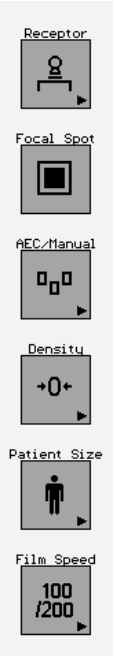
5-1-1 Group 1 Parameter Selection Area

ILLUSTRATION 5-2
PARAMETER SELECTION AREA



The parameter selection area of the display screen allows the user to select different parameters depending on the procedure being done.

In the parameter area of the display screen there are two types of touch buttons:

1. Buttons with an arrow (‣) in the lower right hand corner symbolize there is a submenu to make other selections from, e.g. change from Table Bucky, to Table top, Wall or Tomography.

2. Toggle Button: The focal spot button is the only toggle button on the display screen. When this button is selected it will alternate between small and large focal spot.

Note: If collimation had been set on the collimator first ,do not reset it by Receptor button, otherwise the collimator would automatically close.

ILLUSTRATION 5-3
EXAMPLE OF PULL OUT SCREEN

Selecting a button with an arrow (‣)

To change a parameter that appears on the screen:

1. Touch the parameter of choice
   - A series of new selections will appear
2. Touch the new parameter
3. The new parameter will appear on the display

The following techniques are available with the order of how the buttons will appear:

- Receptor – Wall, Table, Table Top, Tomography
- Focal Spot – Small Focal Spot, Large Focal Spot (Toggle Button)
- AEC/Manual – Right - Left, Center, Right – Center – Left, Right, Left, Right – Center, Left – Center, Manual (No AEC chambers selected)
- Density – + 2, +1, 0, -1, -2
- Patient Size – Small, Medium, Large, Pediatric
- Film Speed – 100/200, 400, 600/800

Note: ***If a site only uses one film screen combination, the field service engineer can remove the button in the service software of the console. Film screen combination is used for AEC only.***

Note: ***If the system is purchased without the AEC option, the console will not display AEC, Density or Film Screen.***

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5-1-2 Group 2 Technique Selection

ILLUSTRATION 5-4
GROUP2 TECHNIQUE SELECTION

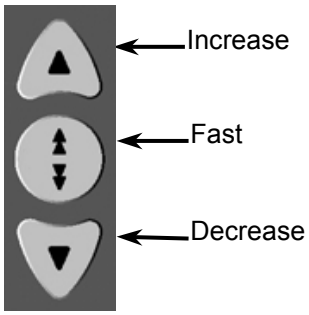
The technique selection area of the display screen allows the user to select different technique factors depending on the procedures being done.

There are four technique factors to choose from:

- kV
- mAs
- mA
- Sec

To change a technique use the up/down arrows on the right side of the touch screen.

ILLUSTRATION 5-5



UP/DOWN ARROWS

The up arrow allows the user to increase the technique factor selected by a factor of 1 for kV or 1 renard step for mAs, mA or sec.

The down arrow allows the user to decrease the technique factor selected by a factor of 1 kV or 1 renard step for mAs, mA or sec.

The middle button allows the user to change the function of the up/down arrows from a 1 step increase/decrease for kV and sec. to a 10 step increase/decrease.

Note: ***When the middle button is selected and you switch between technique factors (kV to mAs) the fast selection will deselect.***

To set a technique

1. To set a technique touch the technique factor buttton of choice (kV, mAs, mA, sec)
   - Once the button is selected, the button will turn black symbolizing the button is active.
2. Use the up/down arrows to increase or decrease the technique factor selected.

Note: ***In the technique area the user will always see a number displayed in the kV button, but if the user selects mAs the numbers will disappear in the mA and sec buttons. If the user selects mA or sec the numbers will disappear in the mAs button***.

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5-1-3 Group 3 Error Message Screen

The Error message area of the display screen displays informational messages to inform the user of system and subsystem operational status. In this situation, all buttons will be inactive except the "OK" button. The following messages will appear in the error message area.

Console Message: X-ray Room Door Open

Recommended Operator Action — The door to the x-ray room is not closed. The system will pro-hibit an x-ray exposure until the door is closed.

Console Message: Receptor Selection error

Recommended Operator Action — This error will occur when the selected receptor is not configured on the Jedi generator configuration menu.

Console Message: **Error 30** Tube Spit error

Recommended Operator Action: — The Proteus XR/a system has detected a tube spit error. Press the reset button and try the exposure again. If error occurs again note the error and call service.

Console Message: **Error 40** Rotation error

Recommended Operator Action: — The Proteus XR/a system has detected a rotation error. Press the reset button and try the exposure again. If error occurs again note the error and call service.

Console Message: **Error 50** Heat (filament) error

Recommended Operator Action: — The Proteus XR/a system has detected a heat (filament) error. Press the reset button and try the exposure again. If error occurs again note the error and call service.

Console Message: **Error 60** Exposure error

Recommended Operator Action: — The Proteus XR/a system has detected a exposure error. Press the reset button and try the exposure again. If error occurs again note the error and call service.

Console Message: **Error 70** Power Supply error

Recommended Operator Action: — The Proteus XR/a system has detected a power supply error. Press the reset button and try the exposure again. If error occurs again note the error and call service.

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Console Message: **Error 80** Hardware error

Recommended Operator Action: The Proteus XR/a system has detected a hardware error. Press the reset button and try the exposure again. If error occurs again note the error and call service.

Console Message: **Error 90** Software error

Recommended Operator Action: The Proteus XR/a system has detected a software error. Press the reset button and try the exposure again. If error occurs again note the error and call service.

Console Message: **Error 100** System Communication error

Recommended Operator Action: The Proteus XR/a system has detected a system communi-cation error. Press the reset button and try the exposure again. If error occurs again note the error and call service.

Console Message: **Error 110** Tube/generator overheat error

Recommended Operator Action: The Proteus XR/a system has detected a tube/generator overheat error. Press the reset button and wait until tube cooling down then try the exposure again. If error occurs again note the error and call service.

Console Message: **Error 120** Application error

Recommended Operator Action: The Proteus XR/a system has detected a application error. This maybe due to a technique selection error or when the exposure switch was released before the exposure was completed. Press the reset button and change the technique or make sure to hold down the exposure switch untill the exopsure is completed, then try the exposure again. If error occurs again note the error and call service.

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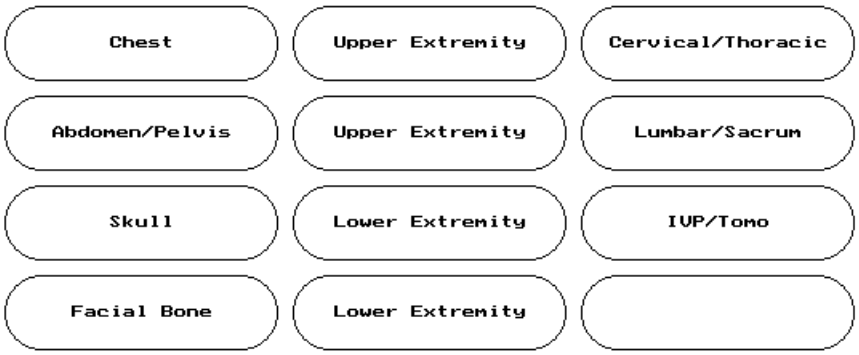
5-1-4 Group 4 Anatomical Programming (APR) with Procedure Edit

ILLUSTRATION 5-6
ANATOMICAL PROGRAMMING GROUP



The APR section of the display screen allows the user to select different preset protocols depending on the procedure being done. There are 12 categories in which the user can select from. Under each of the 12 categories are 9 different procedure buttons and a home button. Each button is a name of a procedure with preset parameters and techniques. Once the user selects the category and procedure an exposure can be taken

The 12 categories include:

Category Name	Procedures in Category
1. Chest	Chest, Ribs, Sternum
2. Upper Extremity	Hand, Finger, Wrist, Forearm, Elbow
3. Cervical/Thoracic	Cervical, Thoracic
4. Abdomen/Pelvis	Abdomen, Pelvis, Hip
5. Upper Extremity	Shoulder, Humerus, Sternoclavicular, AC Joints, Clavicle, Scapula
6. Lumbar/Sacrum	Lumbar, Sacrum, Coccyx
7. Skull	Skull, Sinuses, TMJ
8. Lower Extremity	Foot, Toes, Ankle, Tibia/Fibula, Oscalcis
9. IVP/Tomo	KUB, IVP Tomo
10. Facial Bone	Facial Bone, Nasal Bone, Zygomatic Arch, Orbits
11. Lower Extremity	Knee, Patella, Femur, Hip
12. Custom choice.	Area where user can put 9 procedures of

To Use APR

1. Select a category

   When the category is selected the procedure screen appears with the first procedure in the category active. The active procedure will be a darker shade of blue then the other procedures.

2. a. If this is the procedure, an display exposure may be taken.
   b. If not select the procedure of choice, then take the exposure.
   c. If a parameter or technique needs to be changed, change the parameter or technique and then take the exposure.

Note: ***An active procedure will be a dark shade of blue. Once a change is made to a procedure the key will change back to the lighter shade of blue. An exposure can be taken when a change is made, or any procedure can be reselected.***

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5-1-5 AEC (Automatic Exposure Control) Operation – Optional Feature

The Proteus XR/a generator supports three field Ion Chambers in the table or wall stand bucky/cassette tray for all radiographic applications. AEC is an optional feature. The AEC function allows the operator to select the automatic radiographic exposure control by corresponding field area selection.

The following fields are supported by the system console:

TABLE 5-1
AEC AREA(S) SELECTED

AREA(S) SELECTED	APPLICATION	PATIENT POSITIONING
None	AEC is off and the operator is taking a manual exposure	
No.2 Only	To control exposure for an area of interest that is at center of the X-Ray field.	Position the area of interest in the X-Ray field center
No.1 Only	To control exposure for an area of interest that is in the upper left quadrant of the full sized radiograph (Note 1)	Position the area of interest in the upper left quadrant of the X-Ray field
No.3 Only	To control exposure for an area of interest that is in the upper right quadrant of the full sized radiograph (Note 1)	Position the area of interest in the upper right quadrant of the X-Ray field
No.1 and No.3 together	To control exposure for two symmetrical parts of the body such as the lungs or kidneys (Note 2)	Position the area of interest to be aligned with the No.1 and No.3 sensing areas.
	To control exposure for two areas of interest that are in the upper left and center of the X-Ray field	Position the area of interest to be aligned with the No.1 and No.2 sensing areas.
	To control exposure for two areas of interest that are in the upper right and center of the X-Ray field	Position the area of interest to be aligned with the No.2 and No.3 sensing areas.
All areas together	To control exposure to allow the average density of the whole radiograph to approximate the value of the preselected density.	Position the area of interest within the boundaries of the X-Ray field.

Note:

1. ***Areas No.1 and/or No.3 are to be used with a full size field of 10″×12″ (254mm×305mm) or larger.***
2. ***As area No.2 is not selected for this application, the vertebral column should not affect the exposure, providing that the patient is correctly positioned.***

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AEC Density Compensations:

The system console has five stations for density correction. Normal density is automatically selected when AEC is on. The five stations of density corrections are: +2, +1, 0, -1, -2.

See the table below for density change specifications.

Scale	Density	Factor	Density correction tolerance
2	59%more than A	A * 1.26 * 1.26	+/-10% * (A * 1.26* 1.26)
1	26%more than A	A * 1.26	+/-10% * (A * 1.26)
0	A	1	--
-1	20% less than A	A / 1.26	+/-10% * (A/1.26)
-2	37% less than A	A / 1.26 /1.26	+/-10% * (A/1.26/1.26)

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5-2 Procedure Edit

Procedure Edit is a computer program with predefined x-ray procedure parameters. This program is designed with pre-programmed protocols. Each protocol loaded can be edited or new protocols may be stored.

5-2-1 Accessing Procedure Edit

1. From the main screen of the system console, select the **Procedure Edit** button.

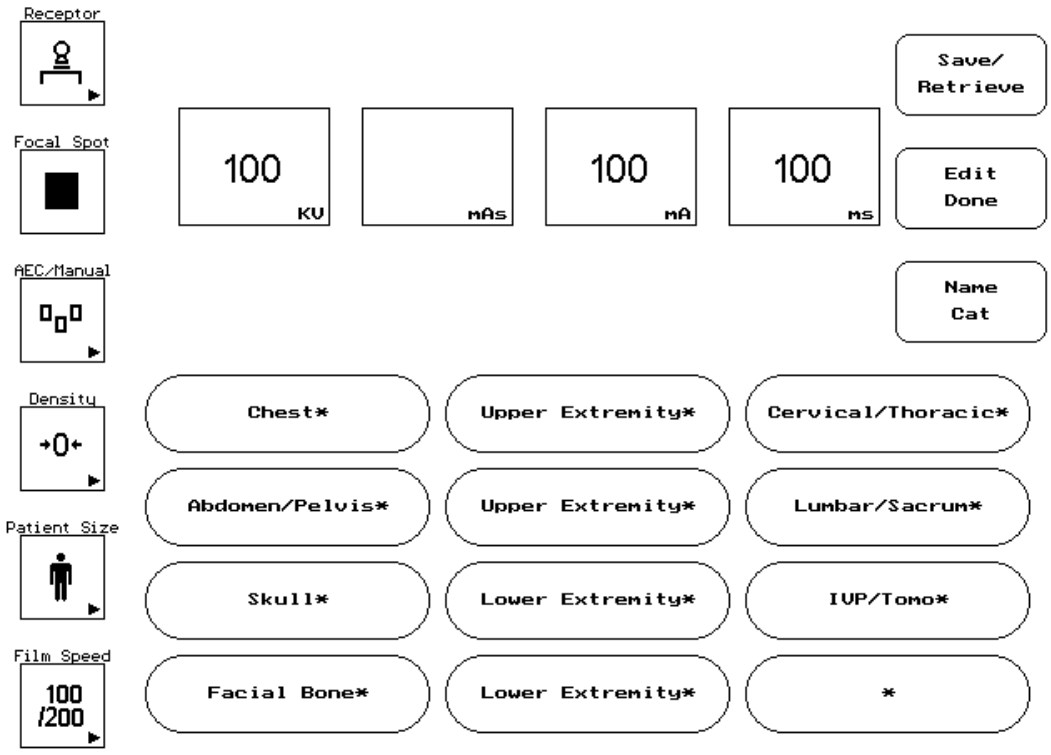
2. From any procedure menu screen on the system console, select the **Procedure Edit** button.

Note: ***To make any changes to procedure edit, the procedure edit floppy disk must be inserted into the disk drive.***

5-2-2 Getting Started

The procedure menu, shown in Illustration 5-7, is the Category screen of procedure edit. This screen was selected from the main screen.

ILLUSTRATION 5-7
PROCEDURE EDIT SCREEN



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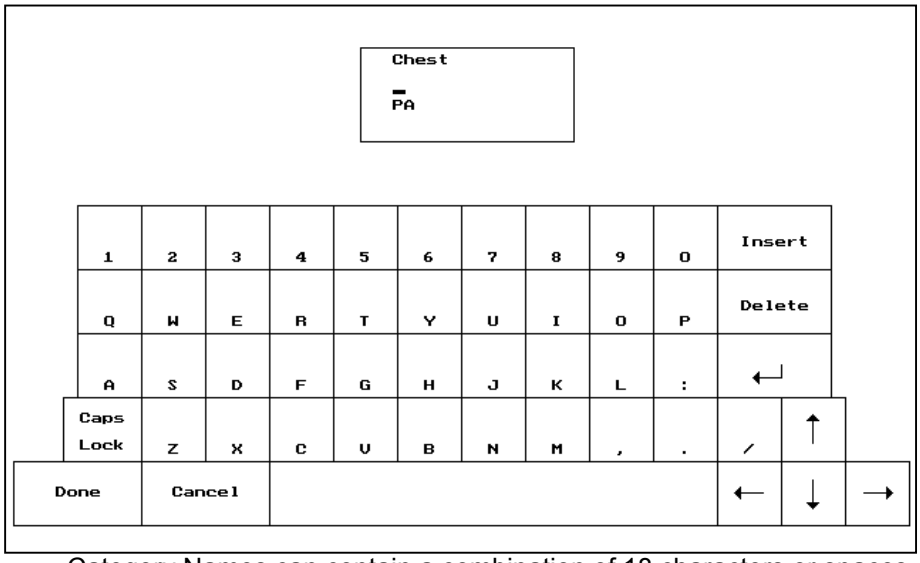
5-2-3 Category Screen

To Name or Change a name of a Category:

1. Touch the **Name Cat** button.
2. Touch the name of the category to be changed e.g. Chest
3. The screen will change to the keyboard screen.
4. Type in the new name of the procedure.
5. Touch the **Done** button to exit out of the keyboard.
6. Touch the **Edit Done** button to exit procedure edit.

Example of the keyboard screen:

ILLUSTRATION 5-8
EXAMPLE OF KEYBOARD SCREEN



Category Names can contain a combination of 18 characters or spaces. The name appears between the brackets above the keyboard as it is typed. The keyboard operation is similar to a typewriter.

- Insert allows characters to be typed anywhere within the existing text. Any characters to the right of the text will move over on character at a time.
- Delete Char removes the character to the left of the cursor.
- Caps Lock switches text between small and capital letters.
- Cancel lets you exit out of the keyboard screen without any changes.
- ↵ This arrow button allows the user to skip down to the second line of the text box.
- Left, right, up and down arrows move the cursor in the direction of the arrow.
- Done saves the name and returns to the Procedure Edit screen.

Note: ***You can only input English characters.***
If the user is in the typewriter screen and does not want to change the name touch the cancel button. Touching the done button will erase the name.

To go to a Procedure Screen from the Category Screen:

1. Touch the **Category Button** of the procedure.
2. The screen will change to the procedure screen.
3. Editing from the procedure screen can be done.

Note: ***To change any procedure the procedure edit disk must be inserted into the floppy disk drive.***

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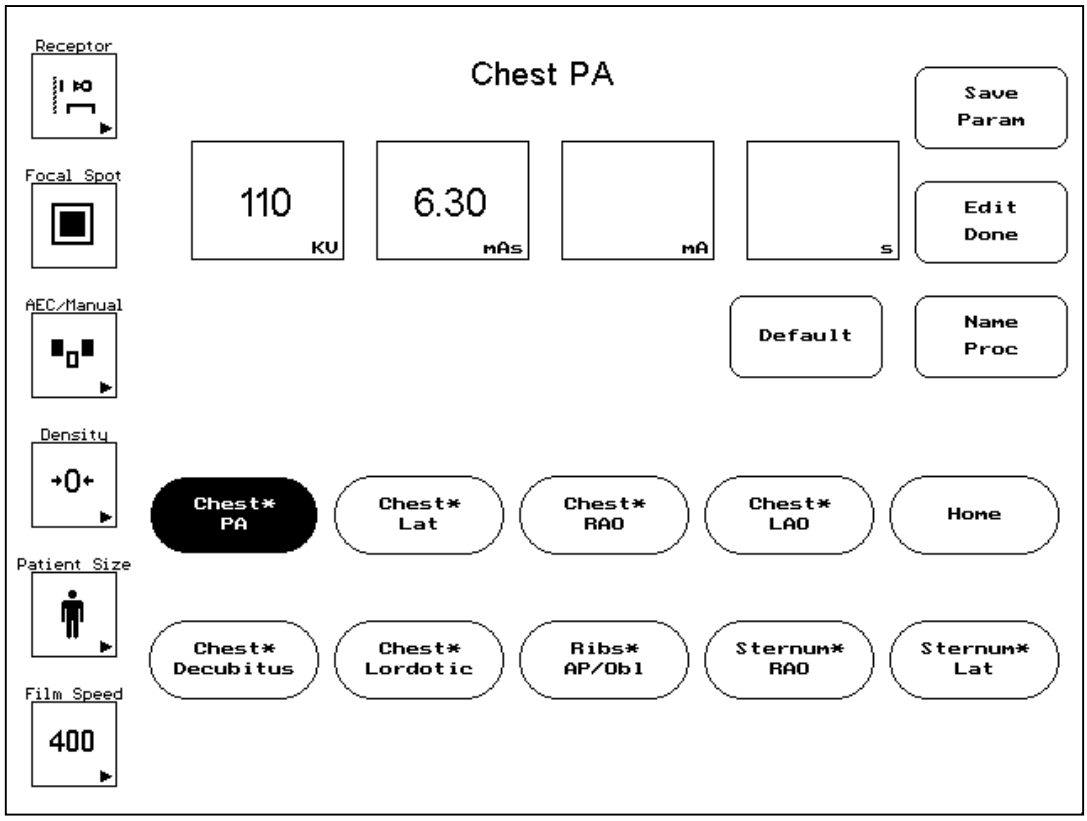
5-2-4 Procedure Screen

To Name or Change a name of a Procedure:

1. Touch the **Name Proc** button.
2. Touch the name of the procedure to be changed e.g. Chest PA
3. The screen will change to the keyboard screen.
4. Type in the new name of the procedure.
5. Touch the **Done** button to exit out of the keyboard.
6. Touch the **Edit done** button to exit procedure edit.

Illustration 5-9
PROCEDURE SCREEN



Procedure Names can contain a combination of 11 characters or spaces per line. There are a total of 2 lines per procedure. The name appears between the brackets above the keyboard as it is typed. The same keyboard will appear as in the category screen.

To change parameters or technique in a procedure

1. Select procedure of choice (procedure button will be a darker shade of blue).
2. Select the parameter/technique button to be changed.
3. Change the parameter/technique.
4. Select the save param button.
5. Touch the edit done button.

Note: ***If the changes to the procedure are the default prameters, touch the default button then save param. The default parameters are the protocol that appears on the screen when the user initially touches a procedure.***

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5-2-5 Save/Retrieve

After entering procedures, it is a good practice to save them on a diskette. The information may be transferred in similar rooms to reduce the time spent making the next set of procedures. A specially formatted disk is needed and supplied with each system.

Save

Insert the specially formatted APR diskette into the floppy Disk Drive.

1. Touch **SAVE BACKUP** to copy all procedure editing information from the current room onto the diskette. This information will overwrite any data that was already on the diskette.

Retrieve

Retrieve will read procedure editing information off a diskette and store it in the system console computer memory.

1. Insert the diskette containing a previously saved **Procedure Edit Database** into the floppy disk drive.
2. Touch the **RETRIEVE BACKUP** to copy all procedure information to the system.
3. Touch the **EXIT** button to exit this menu.

Note: Remove the APR disk after completing the APR revision.

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5-3 Application

Introduce the detailed operating on Proteus XR/a system.

5-3-1 Technique Selection

1.	Select table top	AEC and density can't be selected. 3 point & 2 point mode can be switched
2.	Select BUCKY & AEC (include table and wall if BUCKY & AEC is configured)	3 point without AEC, 3 point with AEC, 2 point without AEC, 2 point with AEC can be switched
3.	Select TOMO	With AEC, without AEC can be switched (only in 2 Point mode and displays value, also it can be switch to 3 point mode)
4.	Receptor switch: from table top to bucky, from bucky to table top, from tomo to bucky, from table top to tomo, from tomo to table top	Table, Table Top, Wall (if have), Tomo (if have) can be switched, and OTS receptor also switch accordingly ***Note: If select Table, Wall Stand or Tomo, excluding Table top, as the image receptor when taking exposure either with or without AEC, the cassette tray must be inserted all the way into the Wall Stand Bucky or Table Bucky. If the cassette tray is not inserted all the way into the Wall Stand Bucky or Table Bucky, the exposure will be prohibited either with or without AEC. When select Table top as the image receptor, the cassette should be placed on the table top or the top of SG120 Wall Stand Bucky (SG120 Wall Stand Bucky is in Horizontal position, Angulation is 90°, See illustration 9-2) while not be inserted into the Bucky when taking exposure. And the exposure will be made in Manual mode.*** ***Note: For SG120 Wall Stand, when performing exposure operation with the cassette placed on the top of the Bucky (Bucky is in horizontal position, Angulation is 90°, see illustration 9-2), while not be inserted into the Bucky, the image receptor should be selected to be "table top"on System Console. And the Exposure will be made in Manual mode.***
5.	Mode switch	2 point and 3 point can be switched

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5-3-2 Parameter Change

1.	Select kV, press quick up/down key	kV button is selected and quick change mark can be displayed.
2.	Select kV: press up or down key	kV value can be changed between 40-150 quickly or slowly, if the kV is over limitation, this button will blink , kV on OTS also change accordingly
3.	Select mAs	If in 3 point mode, it will switch to 2 point mode & mAs button is selected
4.	mAs: press up or down key	mAs value can be changed between 0.5-630, if mAs is over limitation, this button will blink , mAs on OTS also change accordingly
5.	Select mA	If in 2 point mode, switch to 3 point mode & mA button is selected(using tomo: it can't be selected)
6.	Select mA: press up or down key	mA value can be changed between 10-1000(According to System Capacity), if mA is over limitation, this button will blink , mAs on OTS also change accordingly
7.	Select s: press quick up/down key	If in 2 point mode, switch to 3 point mode and s button is selected and quick change mark can be displayed (using tomo: it can't be selected)
8.	Select s: press up or down key	s value can be changed between 0.001-6.3s quickly or slowly, if the value is over limitation, this button will blink , mAs on OTS also change accordingly
9.	Select Focal Spot	Focal Spot can be toggled
10.	Select density (if in AEC mode)	Density can be switched
11.	Select film speed (if configured by FE)	Film speed can be switched
12.	Select patient size	Patient size can be switched

5-3-3 Taking Exposure

1.	Prepare & exposure button	Press and hold **prep** button for 1-1.5s, then press **exposure** button down until the exposure is complete. After exposure, the actual exposure parameter will blink display several seconds, then return to normal condition.
2.	Error	If there is some error, the error code will be displayed and quit the exposure.
3.	If with a printer, press print button	The printer will print patient ID, date and last set parameter: kV, mAs (if in 2 point mode) or kV, mA, s (in 3 point mode) and exposure parameter: include: kV, mAs, mA, s , filmsize and SID
4.	Press display button	The console will redisplay the last exposure parameter: kV, mAs, mA, s for 15s, and press any button will return to previous interface. If no exposure has been done: it will display no exposure.

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5-3-4 Console Indicator

1.	System error Led	If there is any system error, this Led will be on.
2.	Thermal error Led	If tube temperature is over limitation, this Led will be on.
3.	Error message	When any error occur, console will display some error message and error code: technique error, parameter error, AEC error, rotor thermal error, inverter thermal error, tank thermal error, Door Open in exposure.
4.	PREP Led	Press and hold PREP button, the PREP lamp will be on.
5.	Exposure Led	During X-ray emission, this lamp will be on.
6.	Buzzer	During X-ray emission, it will be on.
7.	Turn auto/manual switch	Manual lamp on or off
8.	Table in PBL: when table in center, SID in detent, Cassette in place (if have tray selected)	Exposure ready is on, or exposure holder is on
9.	WALL in PBL: when wall SID in detent, Cassette in place	Exposure ready is on, or exposure holder is on
10.	TOMO in PBL: when table in center, SID in detent Cassette in place (if have tray selected)	Exposure ready is on, or exposure holder is on
11.	IN manual	Exposure ready is on, exposure holder is off

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5-3-5 APR

	Press any APR button on main screen	Enter the sub-APR interface and the parameter display will not change
	Press home in any sub-APR interface	Go back to the upper interface
	Press sub-APR button	The button will be selected and the parameter displayed will change accordingly.
	Insert the APR disk, then press procedure edit button in main screen.	Enter main screen edit interface, in this screen, the parameter or technique can't be changed or selected.
	Press name cat button and then press any APR button	Enter the name edit interface and edit the APR name (only in English)
	Press Save/Retrieve button	Enter save & retrieve backup interface
	In save & retrieve interface: press save button	Save the APR name to the floppy disk
	In save & retrieve interface: press retrieve button	If the floppy disk have the relative file, it restore the file to system or it display error
	In save & retrieve interface: press exit button	Return to the main screen edit interface
	In edit interface : Press edit done button	Save the category name to the system and return to the main screen interface
	In sub-APR interface: press procedure edit button	Enter the sub-APR procedure edit interface
	Press name proc and any sub-APR name	Enter the name edit interface and edit the name (only in English) Press edit done button to save the procedure name to the system and return to the upper interface. * Press home button will also return to upper interface, but it will not save the new procedure name.
	Insert the specific floppy disk and Press the save param button	Save the parameter to the hard disk
	Press the default button	Save the receptor and patient size as the default entrance of the relative sub-APR
	Press edit done button	Save the procedure name to the system and return to the upper interface.
	If error occurrence	Display error message and reset button, Only reset button is active in this state, dispose the error and press reset button to return.

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CHAPTER 6 PROTEUS XR/A TABLE COMPONENTS

6-1 Safe Operation Precautions

6-1-1 General

WARNING

THE TABLE MUST BE USED ONLY BY QUALIFIED PERSONNEL AND ONLY AFTER TRAINING IN THE SPECIFICS OF PROTEUS XR/A TABLE OPERATIONS.

WARNING

IT IS THE RESPONSIBILITY OF THE OPERATOR TO ENSURE THE SAFETY OF THE PATIENT WHILE THE TABLE IS IN OPERATION BY VISUAL OBSERVATION, PROPER PATIENT POSITIONING, AND USE OF THE PROTECTIVE DEVICES PROVIDED.

WARNING

THOROUGHLY CHECK THAT THERE IS NO INTERFERENCE OR POSSIBILITY OF COLLISION BETWEEN THE PATIENT AND OTHER EQUIPMENT.

6-1-2 Patient Positioning Precaution

ALWAYS BE ALERT TO PATIENT SAFETY CONCERNS:

WARNING

NEVER LEAVE THE PATIENT UNATTENDED. AN UNATTENDED PATIENT COULD FALL FROM THE TABLE, ACTIVATE A MOTION CONTROL, OR CAUSE OTHER UNINTENDED PROBLEMS THAT COULD BE HAZARDOUS.
CAREFULLY MONITOR ALL EQUIPMENT MOTIONS TO PREVENT COLLISIONS.
ASSIST PATIENT ON AND OFF THE TABLE.

WARNING

DURING TABLE TOP PROCEDURES ENSURE THAT THE PATIENT'S HEAD, HANDS AND FEET ARE COMPLETELY WITHIN THE TABLE TOP AREA. IF ANY PORTION OF THE PATIENT'S BODY EXTENDS OVER THE EDGE OF THE TABLE TOP AREA SERIOUS INJURY MAY RESULT.

WARNING

THE MAXIMUM SUPPORTED WEIGHT WITH THE TABLE TOP FULLY EXTENDED TOWARD THE HEAD OR FOOT END OF THE TABLE IS 220 KG (484 LB), PROVIDED THE PATIENT IS FULLY PROSTRATE. EXCEEDING THIS LIMIT MAY CAUSE EQUIPMENT DAMAGE OR INJURY TO THE PATIENT.

WARNING

MAKE SURE THAT PATIENT CONNECTED LINES, TUBES, ETC. ARE LONG ENOUGH TO ALLOW FULL TRAVEL OF THE SYSTEM AND WILL NOT BECOME PINCHED OR PULLED.

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6-1-3 Table Top Motion

WARNING

WHEN THE POWER TO THE TABLE IS CUT, THE TABLE TOP CAN MOVE FREELY (LONGITUDINAL). TO AVOID INJURIES, MONITOR THE TABLE TOP MOVEMENT.

WARNING

PRIOR TO RAISING OR LOWERING THE TABLE TOP, ENSURE THERE ARE NO OBSTRUCTIONS PRESENT ABOVE OR BELOW. ***(SEE 6-1)***

WARNING

BEFORE THE PATIENT GETS UP ONTO OR DOWN OFF OF THE TABLE TOP ALWAYS PRESS THE TABLE TOP MOVEMENT LOCK BUTTON TO BLOCK THE CONTROL PEDAL FUNCTIONS MOMENTARILY, AND THEREFORE AVOID INJURIES TO THE PATIENT OR DAMAGE TO THE EQUIPMENT IF A CONTROL PEDAL IS ACCIDENTALLY STEPPED ON.

6-1-4 HAND GRIPS

WARNING

ALWAYS USE HAND GRIPS TO AVOID INJURY TO FINGERS AND HANDS. THE PATIENT'S HANDS MUST BE KEPT AWAY FROM TABLE TOP EDGES AT ALL TIMES.

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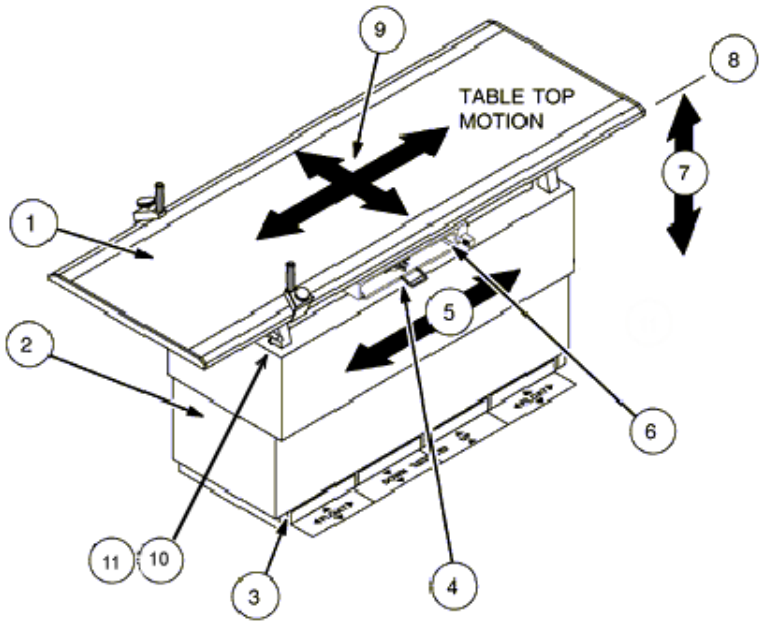
6-2 Introduction

This section provides a general description for the Proteus XR/a table.

ILLUSTRATION 6-1
PROTEUS XR/A TABLE



1 Table Top
2 Table Base
3 Foot Pedals (on both side)
4 Cassette Tray
5 Bucky Film Cabinet Motion
6 Bucky Film Cabinet
7 Table Elevating Motion
8 Maximum Table Top Height (800mm)
9 Table top motion
10 Emergency stop
11 Table inhibition button

The Proteus XR/a Table is a radiographic positioner composed of:

- Table top.

  The table top is made of foam. Its dimensions are 2200mm in length and 880mm in width. Its filtration is less than 1.1 mm of aluminum at 100 KV.

  The table top can be moved longitudinally and transversely for easy patient positioning. Even when it is fully extended horizontally it can support a prostrate patient weighing up to 220 kg (484 lbs.), in accordance with Standard UL2601.

- Elevating Base.

  The elevating base raises the table top to a maximum height of 800 mm (31.5”) and lowers it to a minimum height of 500 mm (19.6”).

  The table power supply and electronics are located in the table base.

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- Foot Pedals.

  The control pedals are used to raise and lower the table top and to free the table top for longitudinal and transverse positioning.

- Bucky Assembly.

  The Bucky assembly is mounted on a carriage beneath the table top. It contains a Manual Cassette Tray which accepts all standard sizes of cassette ranging from130 x 180 mm to 350 x 430 mm (5 x 7”to 14 x 17”).

  An ionization chamber can be located beneath the Bucky grid to implement automatic exposure control. This is a optional component.

- Telescopic Covers.

  These covers are assembled in two levels. Their purpose is to cover the table power supply, and the electronic and mechanical components located in the table base. This is essential when the table top is raised or lowered.

- Hand Grips.

  Two hand grips are included with the Proteus XR/a. These serve to maintain the patients’ hands away from the table top edges and to give patients a feeling of security. The grips are not intended to support the weight of patients. For safety reasons the patient handgrips must be used during all examinations. The grips slide onto the side rails of the table top. They can be locked in place in any position along the side rails with the thumbscrews.

- Lock Buttons.

  Two lock buttons are located on both front and back table base. They are used to inhibit the table up-down and table top movement.

- Emergency Buttons.

  Two emergency buttons are located on both left and right side of the table. These buttons are used to remove power from the table in an emergency.

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6-3 TABLE OPERATION

6-3-1Emergency Stop

The Proteus XR/a Table is equipped with an emergency stop switches located on the left and right side of the table. *(See Illustration 6-1)*

In the event of an emergency, press the emergency stop in with force. When normal conditions are confirmed, turn the button clockwise so the table can be powered up.

6-3-2 Raising and Lowering the Table Top

To raise and lower the table, press the foot pedal **two** consecutive times. This will activate the foot pedal switches. *(See Illustration 6-1.)*

Raising the Table top

To raise the table, press the control pedal **two** consecutive times and hold down until the desired height is reached.

Lowering the Table top

To lower the table, press the control pedal **two** consecutive times and hold down until the desired height is reached.

Note: ***The Table top automatically stops when reaching its maximum and minimum height: 800 mm (31-1/2"nono) and 500 mm (19-2/3"). It may also stop when the operator takes their foot off of the pedal.***

The Proteus XR/a Table is equipped with a collision detection system. If contact is made between the table top and a foreign object such as a stool while lowering the table top, the requested motion will automatically stop until the collision condition is removed. This is accomplished by either clearing the foreign object from the table top movement path or by requesting the reverse movement of the table top.

To avoid jamming, do not put your foot right under the table outer cover when table is driven down to the lower limit.

DO NOT TRY TO RAISE OR LOWER THE TABLE BY MEANS OF THE CONTROL PEDAL WHILE THE TABLE AND XT SUSPENSION ARE CONNECTED BY A TOMO-LINK UNLESS XT LOCKS ARE RELEASED, OTHERWISE, THE TOMO-LINK MAY BE DAMAGED. REFER TO DIRECTION 2122884-100.

6-3-3 Inhibition Button for Table Elevation or Table Top movement

To prevent the table elevation or Table top movement, presses down the inhibition button. This button will simultaneously light symbolizing and the table functions are locked.

When patients are getting on and off the table, to prevent possible falling of the patients from the Table, press down the inhibition button to prohibit the Table Elevation and Table top movement.

6-3-4 Positioning the Table top Longitudinally and Transversely

To position longitudinally and transversely with respect to the X-ray tube, press either outer control pedal. Then you can move the Table top to the desired position manually.
To lock the Table top, release the control pedal.

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WARNING

WHEN MOVING THE TABLE TOP, CARE SHOULD BE TAKEN WHERE THE OPERATOR'S AND PATIENT'S FINGERS ARE PLACED. DO NOT ATTEMPT TO MOVE THE TABLETOP WITHOUT USING THE CONTROL PEDALS TO RELEASE THE LONGITUDINAL AND TRANSVERSE MOVEMENT LOCKS.

WARNING

TO AVOID INJURY TO FINGERS AND HANDS OF PATIENT AND OPERATOR CAUSED BY TABLE TOP MOVEMENT, HANDS MUST BE KEPT AWAY FROM TABLE TOP EDGES AT ALL TIMES.

6-4 Cassette Tray Operation

The Bucky is equipped with a cassette tray which is located in the Bucky tray slot. It accepts cassette sizes ranging from 12.70cmx17.78cm (5"x7") through 14"x17" (35.56cmx43.18cm).

6-4-1 Introduction

See Illustration 6-2 and Table 6-1.

ILLUSTRATION 6-2
CASSETTE TRAY (TABLE OR VERTICAL WALL STAND) OPERATOR CONTROLS

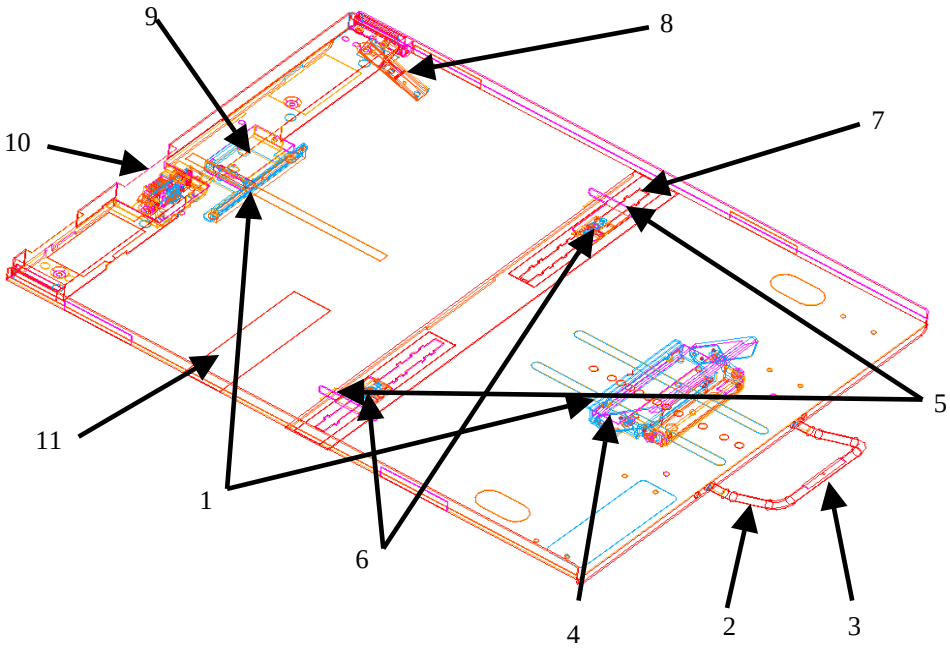

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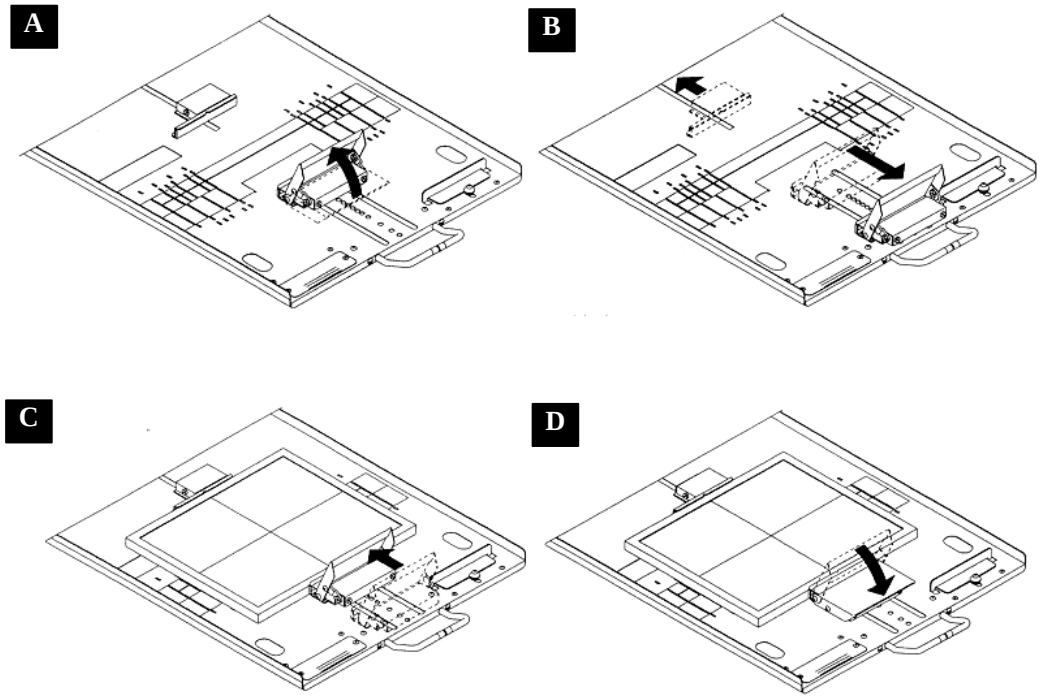
TABLE 6-1
CASSETTE TRAY OPERATOR CONTROLS AND INDICATORS

Item	Title	Type	Description
1	Cassette Grips	Control	Grips the cassette in transverse position. Front grip controls rear grip.
2	Tray Handle	Control	Provides ability to remove or insert tray into Film Cabinet.
3	Alignment Notch	Indicator	Indicates the center of film for alignment with collimator centering light.
4	Grip Lock	Control	Locks cassette into transverse grips.
5	Carrier frames	Control	Aid in centering the cassette in a vertical Bucky.
6	Stopper	Control	Push the stopper to move the Carrier frame
7	Centering Scale	Indicator	Centers the cassette right or left through visual alignment.
8	Tray Stop Release	Control	Release tray stop so that you can remove the tray from the Bucky
9	Cassette In Place Switch	Control	Provides access for cassette removal.
10	Amphenol Connector	Communicator	Deliver message from cassette size sensor.
11	Cassette Size Sensor	General	Auto detect cassette size.

6-4-2 Cassette Loading

ILLUSTRATION 6-3
LOADING CASSETTES INTO CASSETTE TRAY



For Table cassette loading, move Table top fully backwards.

1. To insert a cassette, pull the tray out of the Bucky to the tray stop.
2. Lift the clamping lock handle to unlock it (A).

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3. Slide the clamping lock apart to insert a cassette between the clamps (B).
4. Place the cassette in the tray and center the cassette with either the centring scale or the centering notches in the clamp (C).
5. Push the clamping lock against the cassette(C).
6. Press down on the clamping lock handle (D). Push tray into receptor.

Note: ***To prevent damage to the cassette clamps locking assembly always close it prior to inserting (pushing) the cassette tray into the Bucky.***

Note: ***Normally the cassette tray does not have to be completely removed from the Bucky in order to load a cassette. Cassette may be inserted in the tray by pulling the tray until movement is stopped by the catch on the lower rear of the tray.***

However, if it is desired to remove the tray from the Bucky, pull the tray out until it is stopped by the catch, then press the catch against the tray bottom and hold it while sliding the tray out.

Note: ***If select Table, not Table top, as the image receptor on the System Console (refer to section "5-3-1 Technique Selection" in Chapter 5) when taking exposure either with or without AEC, the cassette tray must be inserted all the way into the Table Bucky. If the cassette tray is not inserted all the way into the Table Bucky, the exposure will be prohibited either with or without AEC.***

6-4-3 Cassette Removal

To remove a cassette from the manual cassette tray, pull the tray out fully by its handle. Pull up on the tightening lever and pull it back away from the cassette. The cassette is now free to be removed.

6-4-4 Alignment

It is important that the X-ray tube unit be transversely centered accurately with the center of the Bucky. Density cut off at the edges of the film and appearances of grid patterns indicate inaccurate transverse alignment. With an anti-diffusion grid vertical alignment is not critical, and tilted tube techniques may be used without undue cut-off.

The center of the cassette tray handle is marked to indicate the longitudinal center of the Bucky to the X-ray beam. Depending on the position of the tabletop, the Bucky handle may need to be pulled out to allow the collimator light to shine on it.

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CHAPTER 7 PROTEUS XR/A OVERHEAD TUBE SUSPENSION

7-1 Introduction

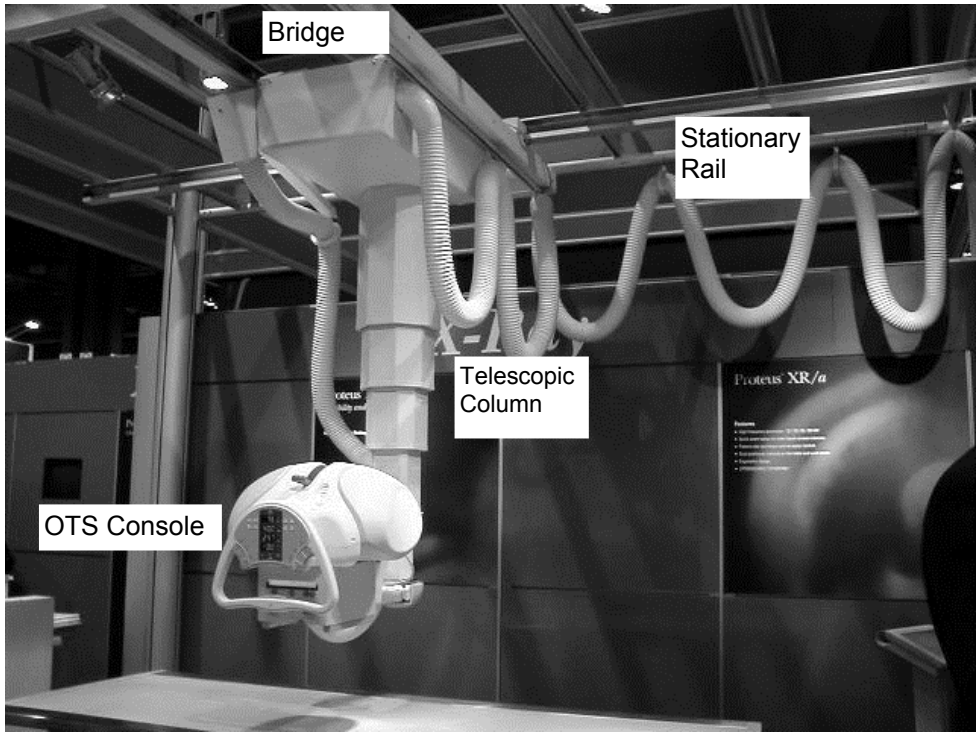
The Overhead Tube Suspension (OTS) is the positioning device that supports the X-ray tube and OTS Console.

Each suspension provides convenient movement and accurate positioning of the equipment.

The X-ray Tube Overhead Suspension consists of four major elements

-The Overhead Rail System,
-The Telescopic Column and Carriage,
-Tube Support and User Interface.
-Multileaf Collimator \ Eclipse Proteus Collimator .

ILLUSTRATION 7-1
OTS Components



7-2 Overhead Rail System

The overhead rail system consists of the stationary rails (ceiling or wall mounted) and a bridge that travels longitudinally (LONG) along the rails. Guide bearings maintain alignment of the bridge with the rails and the X-ray table.

An electric lock controls motion of the bridge along the rails. A switch marked “LONG” on the user interface activates this longitudinal lock. Press down the switch will releases the lock. Releasing the switch reapplies the lock.

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7-3 Telescopic Column and Carriage

The carriage rides laterally (LAT) within the bridge. The lateral lock controls its motion. The switch marked LAT on the front of the collimator operates the lock. This switch functions in the same manner as the one for the longitudinal lock.

The telescopic column permits vertical (VERT) travel of the tube unit. The vertical lock controls its motion. The switch marked VERT on the user interface operates the lock. The switch must be held down while moving the tube unit.

The vertical load is balanced by a spring counterpoise system within the carriage. The counterpoise system is equipped with a **safety**-locking feature to prevent the tube unit from falling in the event of spring or main cable failure. Adding an accessory such as a collimator extension cylinder may cause the suspension to be slightly out of balance.

CAUTION

Proteus XR/a Collimator accessory weight may not exceed 4.5 kg (10 pounds), and Eclipse Proteus Collimator accessory weight may not exceed 7.0 kg (15.4 pounds).Use special care when using such an accessory since the tube unit will tend to descend when the vertical lock is released.

ILLUSTRATION 7-2
TELESCOPIC COLUMN AND CARRIAGE

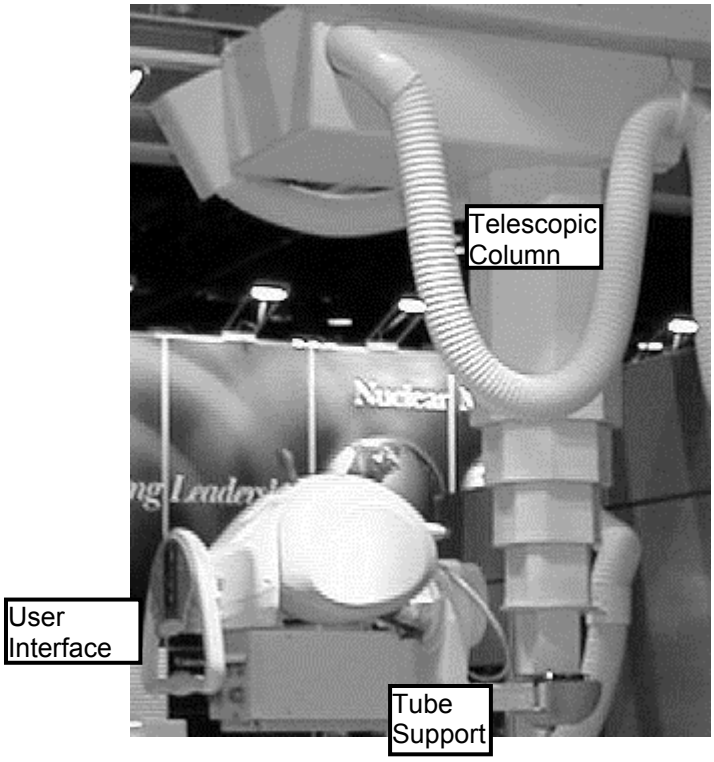

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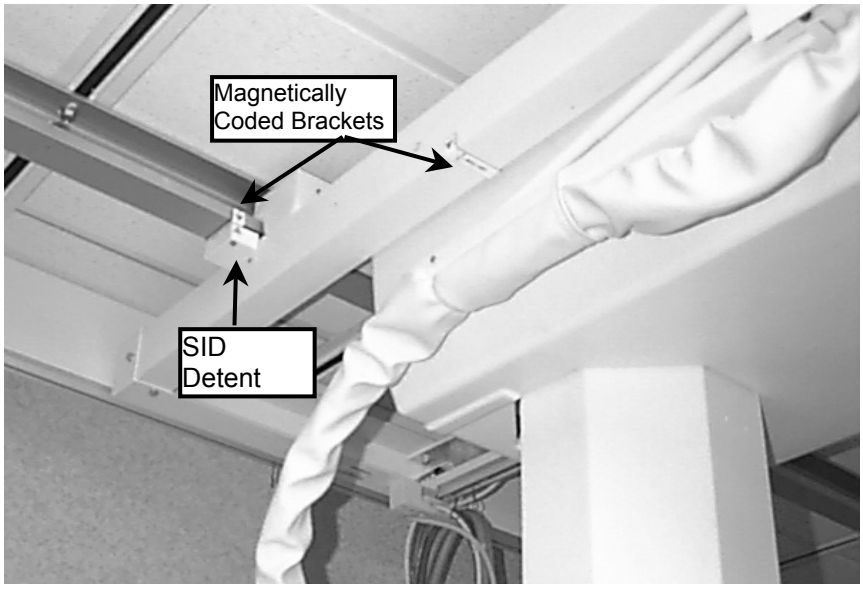
ILLUSTRATION 7-3
SID SENSOR AND BRACKET LOCATIONS



Use of Longitudinal and Transverse Detents

The suspension is equipped with Longitudinal and Lateral detents to automatically apply the locks and signal the collimator when the tube is positioned at specific SID's, for vertical table or wall stand procedures. The locks are actuated through SID detent sensors that ride along the bridge and stationary rails, and detect coded brackets set at pre-determined locations. For table, lateral detent is set at the table lateral centerline. For wall stand, lateral detent is set at the wall stand panel lateral centerline, and the longitudinal detent is set at SID 180cm(72 inches) and 100cm(40 inches). Selection is made at the time of installation and is usually with the focal spot over the longitudinal table and wall stand centreline. The locks are actuated through electrical detents and the switch marked DETENT. Depress the "DETENT" switch and the "LAT" switch to index the focal spot over the longitudinal table centerline. Depress and momentarily hold the "LONG" switch (with the "DETENT" switch still depressed) to index the focal spot at one of the pre-selected SID's. When reaching the approximate position, motion should be slow to avoid passing over the detent bracket. To move out of the indexed positions, depress the "DETENT" switch a second time.

Note: ***The longitudinal and lateral locks are the electromagnet type and are "off" when the power is off. They are applied when the power is on and their switches are in the upper position (not depressed). To release the locks, depress the switches.***

Use of Vertical Detent

There is a vertical detent switch in the Overhead Tube Suspension column that will set the locks when the tube reach the pre-set distance, such as 100cm (40 inches) above the film. Depress the "DETENT" switch and the "VERT" switch to index the focal spot at the 100cm (40 inches) SID.

Note: ***This function doesn't apply to tube angulation radiography.***

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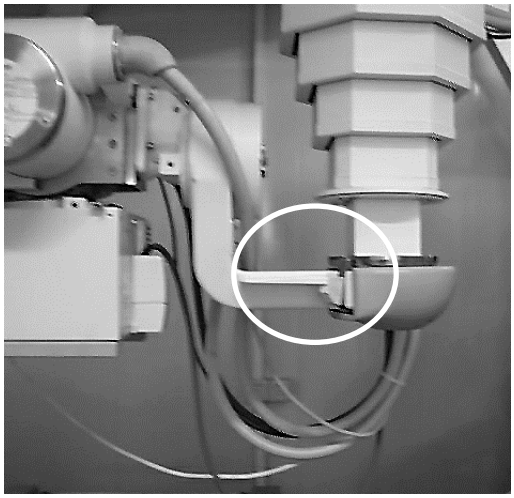
Note: ***The vertical lock are the Electro Magnetic, spring applied, type. They remain "on" when the system power is off. They can be released only when the power is on and their respective switches are depressed. In emergencies, the tube unit can be moved against the force of the locks.***

7-4 X-ray Tube Support

7-4-1 Tube Support Rotation

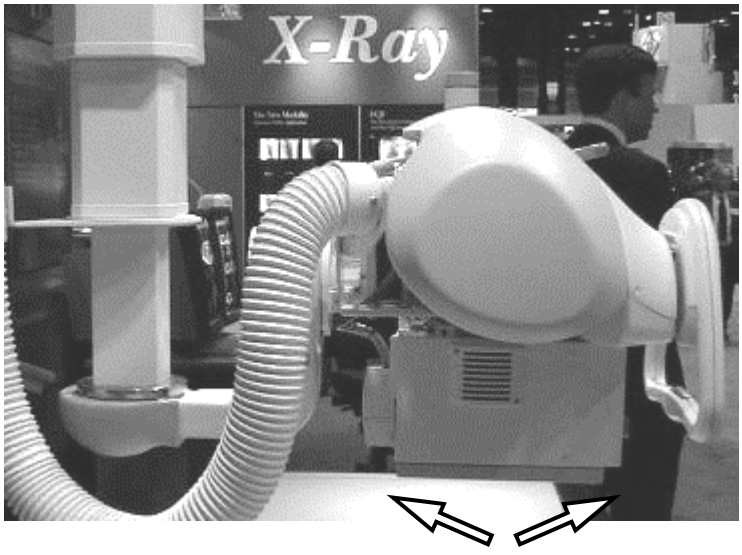
ILLUSTRATION 7-4
TUBE SUPPORT DETENT RELEASE LEVER



The tube unit can be pivoted about the vertical axis of the telescopic column (tube support rotation) 180° in each direction from the table "NORMAL" position. It automatically locks in each 30° position. To release it, depress the tube support rotation lock lever on the right side of the tube support. Then pivot the tube unit and release the lever. The tube support will lock in the next 30° position.

7-4-2 X-ray Tube Trunion Rotation

ILLUSTRATION 7-5
X-RAY TUBE TILT



X-ray tube can be tilt forward along X-ray tube axis (32, 50kW system). Grasp the handle above the tube and move backwards. The tube is now free to be moved. Position the tube to the desired location and move the handle forward to lock the tube in place. To replace the tube to the normal position, move the bar backwards and position the tube. Move the bar forward and lock the arm. On the side of the tube, there is a red line and an arrow to align the tube into correct position.

Note: ***For 65, 80kW system, tube trunion rotation function is not available.***

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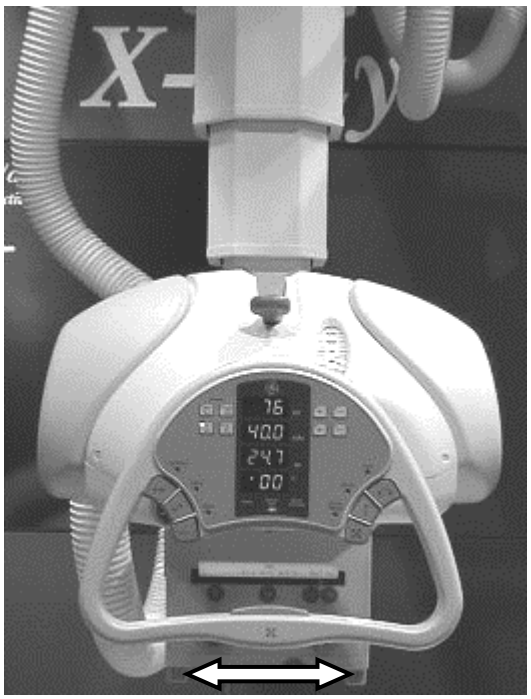
7-4-3 X-ray Tube Angulation

ILLUSTRATION 7-6
X-RAY TUBE ANGULATION



The other rotational feature of the tube support permits TUBE ANGULATION about the short axis (front to back). The amount of angulation is indicated on the user interface. Limits of angulation are 180° in either direction from the X-ray beam down position. The angulation lock that is controlled by the switch marked ANG maintains angular positions. while angulating the tube.

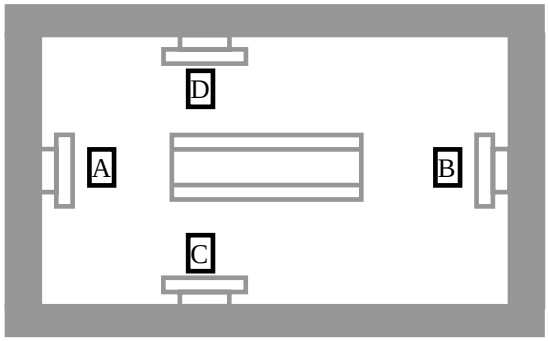
Angular positions will detent every 90° automatically starting with the X-ray beam down position. To move out of a detent position, depress the ANG button and hold this switch down, rotating the tube assembly. Release the button to lock the tube in place.

Note: ***Angulation lock is the Electro Magnetic, spring applied, type. They remain "on" when the system power is off. They can be released only when the power is on and their respective switches are depressed. In emergencies, the tube unit can be moved against the force of the locks.***

CAUTION

The gravity center of the angulating parts (including tube, OTS console, collimator, etc.) is lower than the angulating axis. So when tube angulation is 90 degree, if release the angulation lock, there will be a trend of tube to angulate downward.
When tube angulation is 90 degree, please pay attention to hold the OTS console with both arms as release the angulation lock.

Note: ***When taking exposure with the Wall Stand (GPCP No. 2260354) or SG120 Wall Stand (GPCP No. 2402562), if the Wall Stand or SG120 Wall Stand is mounted to the side of the Table (C or D in the illustration below), the X-ray tube should only be angulated anticlockwise and not be angulated clockwise.***
When angulated anticlockwise, the position of the X-ray tube Anode is lower than angulated clockwise, so the heat dissipation performance of the tube is distinctively better than angulated clockwise.



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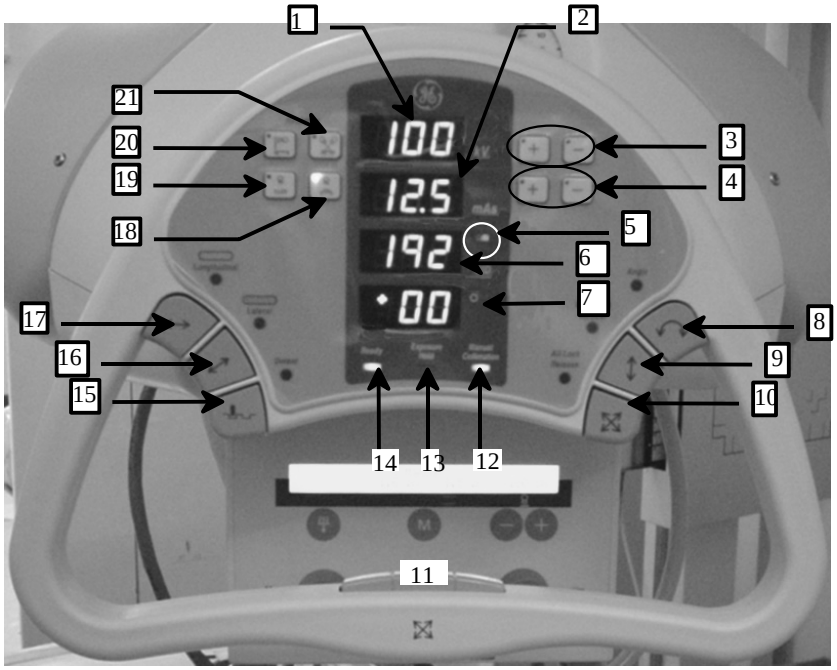
7-5 Over Head Tube Suspension User Interface

The in-room user interface allows the operator to make receptor type, kV and mAs selections without returning to the System Console. Positioning of the X-ray tube can be performed with one or two-hands. The locks and lock releases on the user interface make positioning the X-ray tube easy.

Note: ***Changing exposure parameters or receptors on either system console or OTS console will result in a same change to both consoles.***

ILLUSTRATION 7-7
OTS CONSOLE



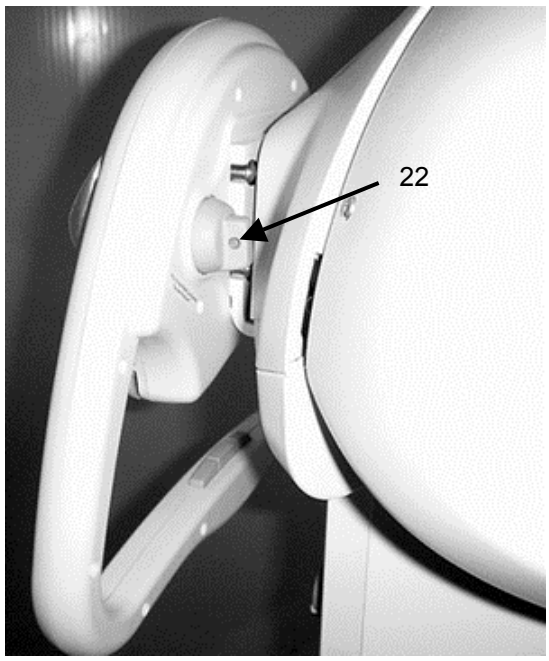


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TABLE 7-1
OTS OPERATOR CONTROLS AND INDICATORS

Item	Title	Type	Description
1	kV Display	Indicator	Display exposure kV.
2	mAs Display	Indicator	Display exposure mAs.
3	kV Increment and Decrement Keys	Control	Increase or Decrease exposure kV between 40-150. If kV is over limitation, up or down key will blink.
4	mAs Increment and Decrement Keys	Control	Increase or Decrease exposure mAs between 0.5-630. If mAs is over limitation, up or down key will blink.
5	Unit Display	Indicator	Display SID scale (It is set in factory).
6	SID Display	Indicator	Display SID scale.
7	Angulation Display	Indicator	Display tube rotation angle.
8	Tube Angulation Lock Release	Control	Releases magnetic lock to allow tube angulation. Normally open momentary type button, without indicator.
9	Vertical Lock Release	Control	Releases magnetic lock to allow vertical tube motion. Normally open self-lock type button, with green indicator.
10	All Lock Release	Control	Releases all OTS magnetic locks to allow vertical, transverse, longitudinal. Normally open momentary type button, without indicator.
11	All Lock Release	Control	Releases all OTS magnetic locks to allow vertical, transverse, longitudinal. Normally open momentary type button, without indicator.
12	MANU. COLI	Indicator	Indicates that the collimator is working in manual mode. In table Bucky mode: when 75°> |tube angle| >10°, auto collimator switch to manual collimator. When |tube angle| >75°, manual collimator switch to auto collimator and exposure holder lamp is on. SID displays 0. In Wall Foot mode: when 75° > | tube angle+90 | >10°, auto collimator switch to manual collimator. In Wall Head mode: when 75° > | tube angle+90 | >10°, auto collimator switch to manual collimator. When |tube angle+90|>75°, manual collimator switch to auto collimator and exposure holder lamp is on. SID displays 0.
13	Exposure Hold	Exposure	Indicates for some reason an exposure is not permitted. (Lateral and longitudinal detent, vertical SID, tube angle, or cassette)
14	READY	Exposure	This button is lit when the system is ready for exposure.
15	DETENT	Control	Lock or Release the Detent magnetic lock. Normally open self-lock type button.
16	Lateral Lock Release	Control	Release magnetic lock to allow lateral motion. Normally closed self-lock type button, with green indicator.
17	Longitudinal Lock Release	Control	Release magnetic lock to allow longitudinal motion. Normally closed self-lock type button, with green indicator.
18	Table Top	Receptor	Selects the Table Top as the image receptor.
19	TABLE	Receptor	Selects the table Bucky/cassette tray as the image receptor
20	WALL	Receptor	Selects the Wall Stand Film Cabinet as the image receptor.
21	TOMO-LINK	Receptor	Selects the Tomo-link as the image receptor.
22	Switch Key	Control	Key for X-ray Field Limitation System Failure.

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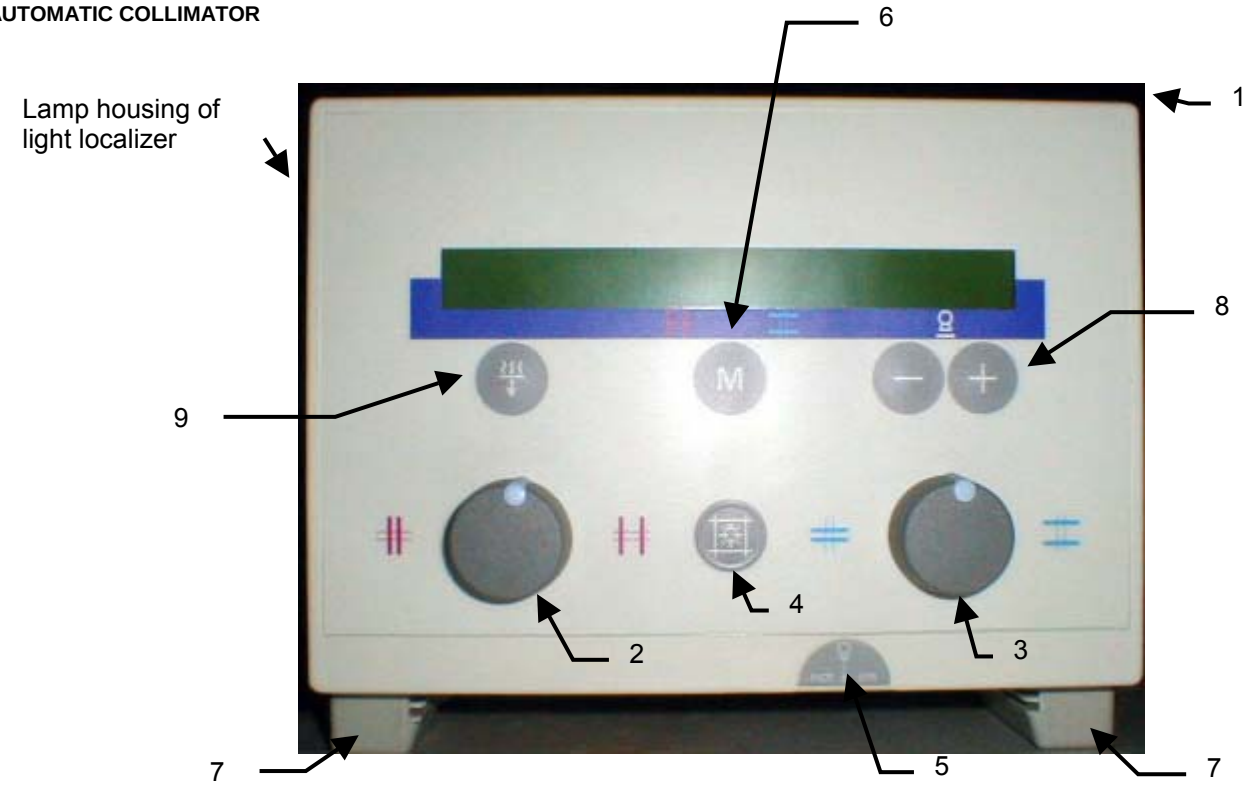
7-6 Proteus XR/a Automatic Collimator

7-6-1 Operational Controls on the ACSS Multileaf Collimator

ILLUSTRATION 7-8
AUTOMATIC COLLIMATOR



(1) Locking lever for ± 90° rotation of the collimator about vertical axis
The collimator stops only in 0°position.

(2) Adjusting knob for format height collimation
(Turning to the left closes the collimator, turning to the right opens the collimator)

(3) Adjusting knob for format width collimation
(Turning to the left closes the collimator, turning to the right opens the collimator)

(4) X-ray field illumination and linear light localizer on/off
Cutout also performed automatically via a time switch.

(5) Measuring tape grip for SID measurement
- Take reading at bottom edge of multileaf collimator.
- The measuring tape has both a cm and an inch graduation

(6) In manual or auto collimator mode, MEMORY button for resetting last exposure format used when current blade width and height are larger than last setting.

(7) Two accessory rails

(8) +,-key: I SID adjusting
- Press + key in manual collimator mode,
  Collimator SID is set to 100cm, 150cm, and 180cm.
- Press - key in manual collimator mode,
  Collimator SID is set to 180cm, 150cm, and 100cm.

(9) No use

Note: ***The light field of the collimator shouldn't beyond 17inch × 14inch (43cm ×36cm) or 14inch × 17inch (36cm ×43cm).***

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Locking lever

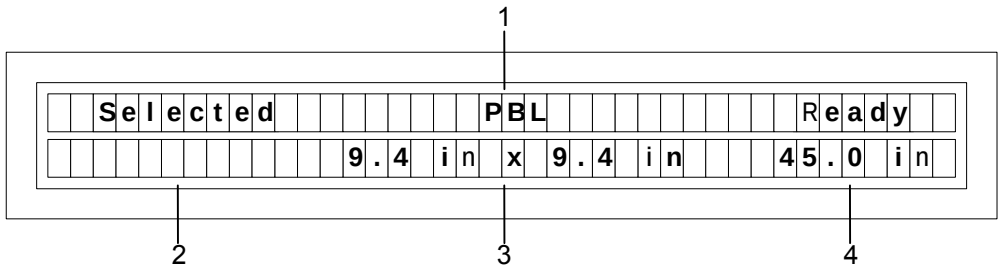
- The locking lever locks the compensating filters, templates, etc. inserted in the accessory rails of the multileaf collimator in place to prevent them from falling out
- To remove an accessory from the collimator, the locking lever must be pressed in until the compensating filter, templates etc., can be removed. - See register on **Accessories** (accessories for multileaf collimator)

CAUTION

When applying the accessories such as compensating filters, templates and cone, please pay attention to ensure the accessories to be supported securely and reliably by the accessory rails.
Otherwise, the incorrect and unsafe insertion of the accessories may result in the falling down and lead to possible injure to the human body or instruments.

7-6-2 Display on the ACSS Multileaf Collimator

ILLUSTRATION 7-9
AUTOMATIC COLLIMATOR DISPLAY



- **Selected** = Bucky workstation on Bucky Table **or** Bucky Wall Stand selected

(1) Operating mode:
PBL = with automatic format collimation system
Manual = Without automatic format collimation system

(2) Free usable field

(3) Display of width and height of collimated x-ray field

(4) Display of film-focus distance (SID)

WARNING

ELECTROSTATIC DISCHARGE MAY CAUSE THE DISPLAY ON THE FRONT OF THE COLLIMATOR TO GO BLANK. THE SYSTEM POWER MUST BE CYCLED VIA THE CONSOLE ON/OFF SWITCH TO RECOVER.

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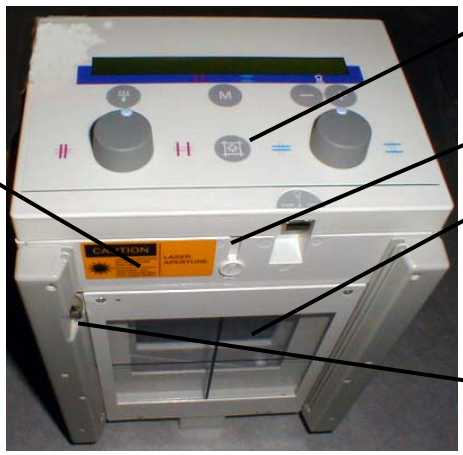
7-6-3 Bottom View of the Multileaf Collimator

ILLUSTRATION 7-10
AUTOMATIC COLLIMATOR BOTTOM VIEW


On/Off switch (4) for illumination of full-field and linear light localizer
Linear LASER light localizer and switch
LASER warning label
Centering cross for positioning
Locking lever for accessories

Linear LASER Light Localizer

The linear LASER light localizer provides the axis mark for longitudinal centering which is lined up with the centering mark on the handle of the cassette loading device. The Laser light will disappear if the switch is shut off.

- The linear LASER light localizer for projection of the centering cross is switched on and off with push button (4) on the control panel.
  - Automatic cutout of this function is affected via an internal time switch.

LASER Warning Label

The operator should pay his attention to the LASER WARNING as follows.

WARNING

LASER RADIATION

PEAK POWER 1MW / WAVE LENGHT 540-700 NM / CLASS II LASER PRODUCT

DO NOT STARE INTO BEAM!

WHEN YOU SWITCH ON THE LINEAR LASER LIGHT LOCALIZER, TAKE CARE THAT NO PERSON LOOKS DIRECTLY INTO THE LASER TO AVOID EYE INJURIES OR IMPAIRED VISION.

Centering Cross

- The centering cross is used to display the longitudinal and transverse axies of the exposure field on the cassette or directly on the patient.
- The full-field light localizer for projecting the centering cross is switched on and off with push button (4) on the control panel.
  - Automatic cutout is performed via an internal time switch.
- The linear and full-field light localizers can not be switched separately.

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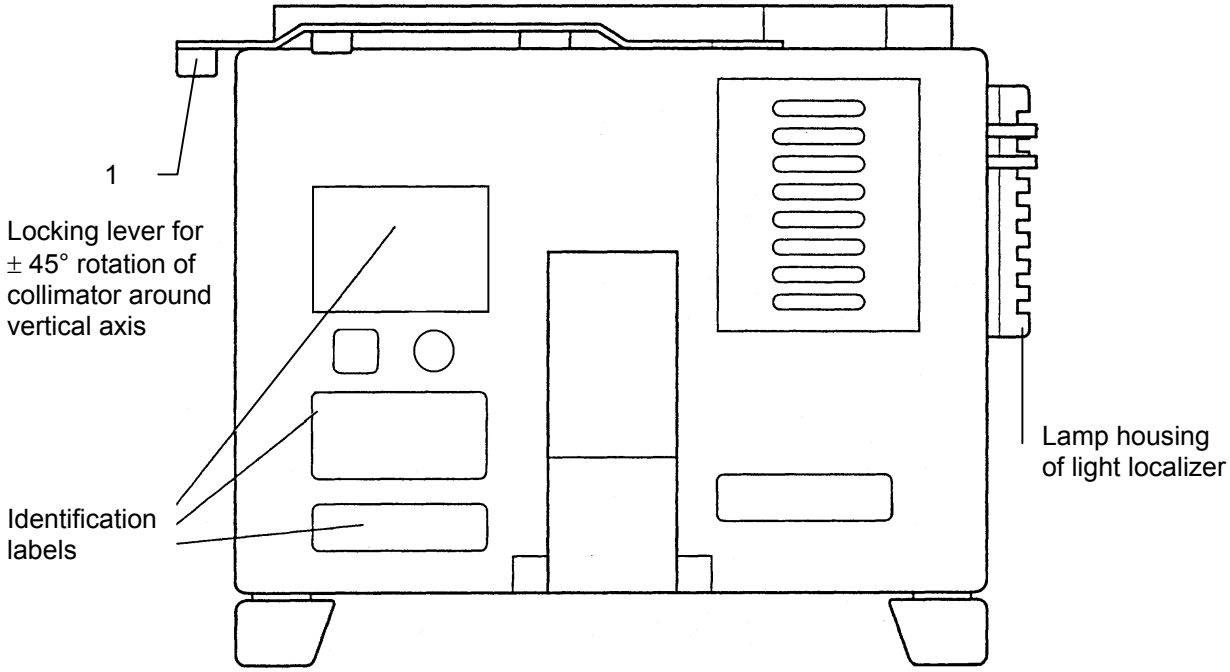
7-6-4 Rear View of Multileaf Collimator

(1) Locking lever for ± 90° rotation of collimator around vertical axis

ILLUSTRATION 7-11
AUTOMATIC COLLIMATOR REAR VIEW


1
Locking lever for ± 45° rotation of collimator around vertical axis
Identification labels
Lamp housing of light localizer

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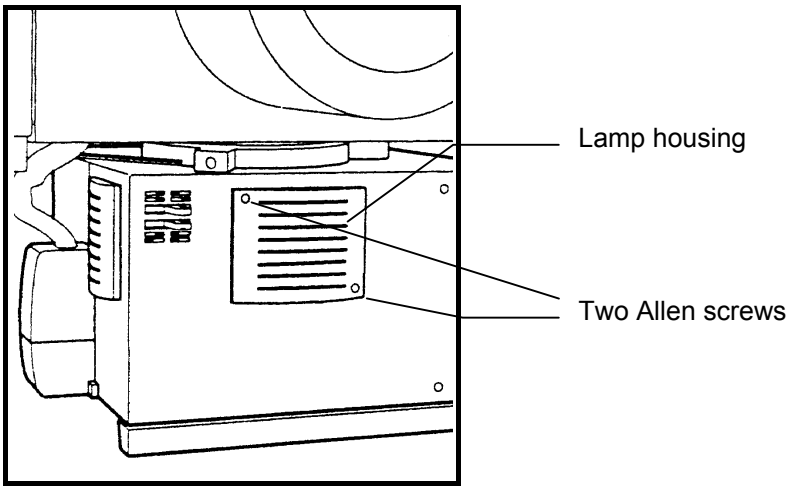
7-6-5 Changing lamps on the multileaf collimator

- The lamp of the multileaf collimator may be changed by the user if occasion demands

ILLUSTRATION 7-12
AUTOMATIC COLLIMATOR LAMP LOCATION



- Switch off the system.
- Undo both Allen screws on lamp housing.
- Remove lamp housing.
- Undo the two Allen contact screws on the lamp.
- Replace defective lamp.
- Do not touch new lamp with your bare fingers.
- Screw the two Allen contact screws tight.
- Mount lamp housing and fasten it by retightening both screws.

WARNING

IF THE HALOGEN LAMP OF THE LIGHT LOCALIZER REMAINS ILLUMINATED FOR A LONGER PERIOD OF TIME, THE HOUSING MAY HEAT UP.

PLEASE AVOID TOUCHING THE LAMP HOUSING TO PREVENT BURNS.

WARNING

ALWAYS USE OEM REPLACEMENT LAMPS FOR THE LIGHT LOCALIZER. HALOGEN LAMPS, WHICH ARE NOT SHORT-CIRCUIT-PROOF, MAY BREAK AND RESULT IN INJURIES CAUSED BY BROKEN GLASS. LAMP TYPE DESCRIPTION: LOOK AT THE LABEL AT THE BACKSIDE OF COLLIMATOR.

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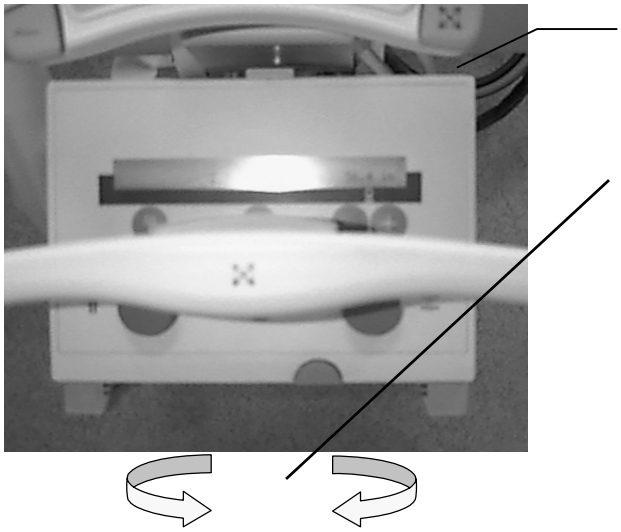
7-6-6 Rotating the Collimator ± 90° around the Vertical Axis

- Move locking lever (1) on multileaf collimator toward front panel, i.e. toward the operator

ILLUSTRATION 7-13
AUTOMATIC COLLIMATOR ROTATION



Multileaf collimator in 0° lock-in position

– The 0° lock-in position of the multileaf collimator is released by actuating the locking lever.

- Grasp multileaf collimator with both hands and rotate it by the desired angle to the required direction.

Rotating the Collimator to the 0° Lock-in Position

- Grasp collimator with both hands and turn it to the 0° lock-in position

WARNING

ALWAYS GRASP MULTILEAF COLLIMATOR IN SUCH A WAY THAT NEITHER HAND CAN BE PINCHED OR CRUSHED BETWEEN THE HANDLES AND THE COLLIMATOR.

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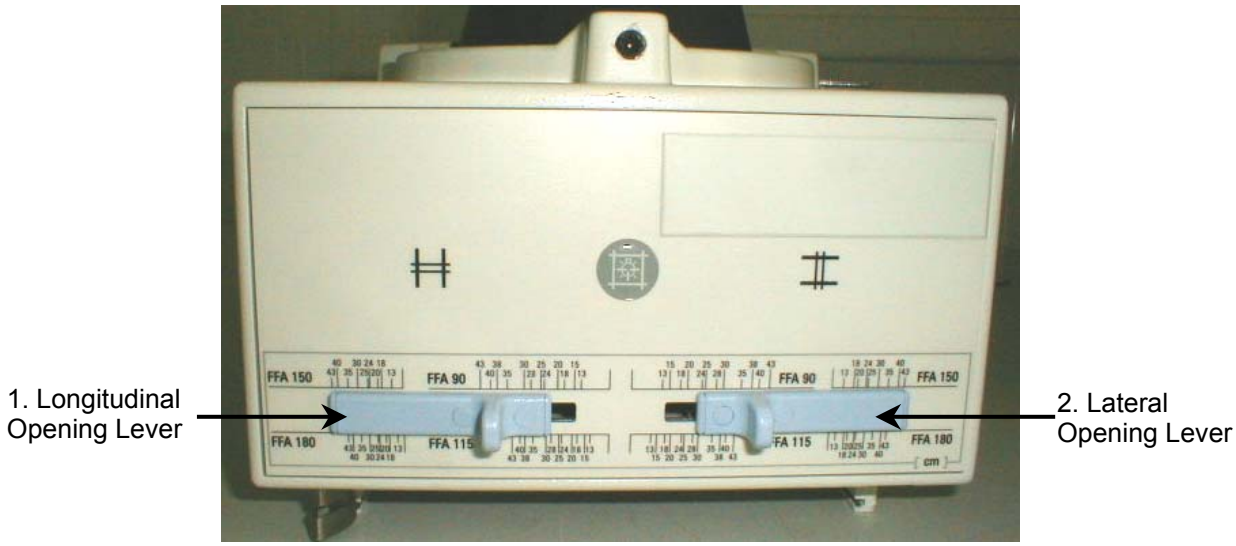
7-7 Proteus XR/a Manual Collimator (Optional)

7-7-1 Operational Controls on the Manual Collimator

ILLUSTRATION 7-14
MANUAL COLLIMATOR



(1) Longitudinal opening lever for longitudinal light field adjusting.

(2) Lateral opening lever for lateral light field adjusting.

Adjust the lever according to the SID you used.

Note: ***The light field of the collimator shouldn't beyond 17inch × 14inch (43cm ×36cm) or 14inch × 17inch (36cm ×43cm).***

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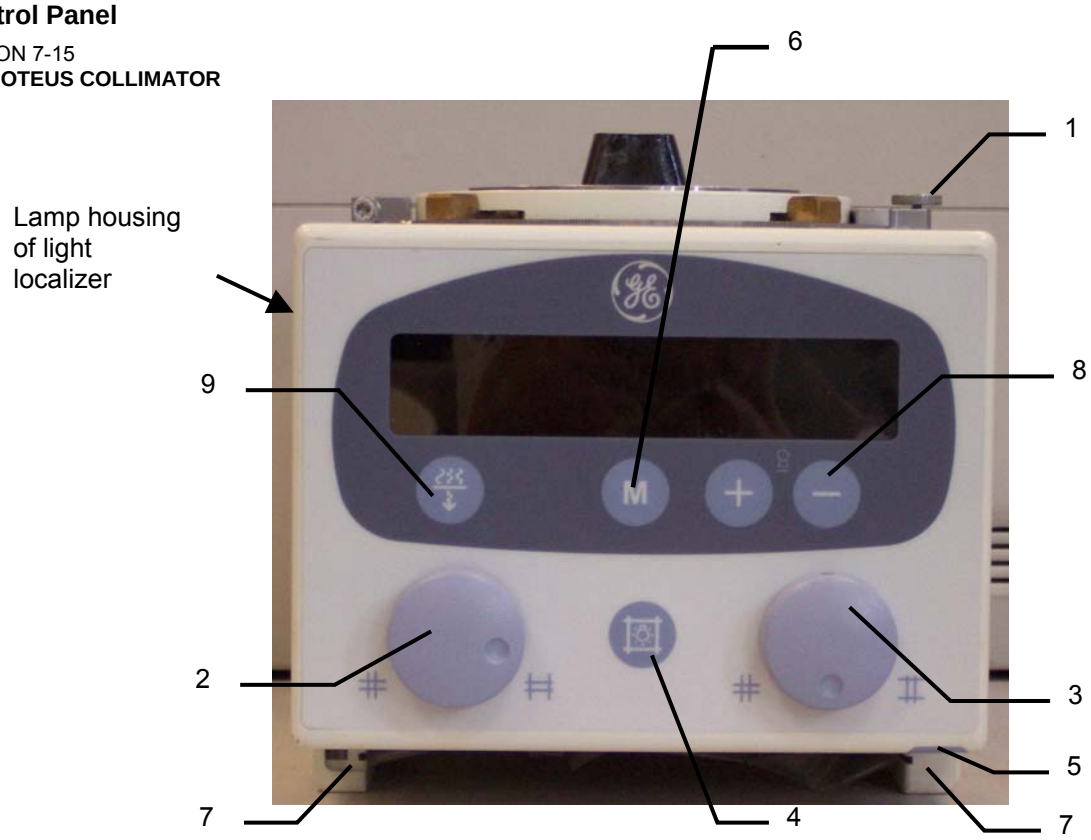
7-8 Eclipse Proteus Collimator

During operation of Eclipse Proteus Collimator, ensure that it is not damaged due to collision, and adhere to the temperature range according to the Eclipse Proteus Collimator Specifications.

7-8-1 Control Panel

ILLUSTRATION 7-15
ECLIPSE PROTEUS COLLIMATOR



(1) Locking screw for ±90º of the collimator around the center beam axis. The collimator stops only in 0° and ±90º position.
(2) Adjusting knob for format height collimation (Turning to the left closes the collimator, turning to the right opens the collimator)
(3) Adjusting knob for format width collimation (Turning to the left closes the collimator, turning to the right opens the collimator)
(4) X-ray field illumination (light localizer) and bucky centering light on/off. Cutoff also performed automatically via a time switch.
(5) Measuring tape grip for SID measurement
- Take reading at bottom edge of collimator.
- The measuring tape has both a cm and an inch graduation

(6) In manual or auto collimator mode, M button for resetting last exposure format used when current blade width and height are larger than last setting
(7) Two accessory rails
(8) +, - key: I SID adjusting
- Press “+” key in manual collimator mode, Collimator SID is set to 100cm, 150cm, and 180cm.
- Press “- “key in manual collimator mode, Collimator SID is set to 180cm, 150cm, and 100cm.

(9) No use

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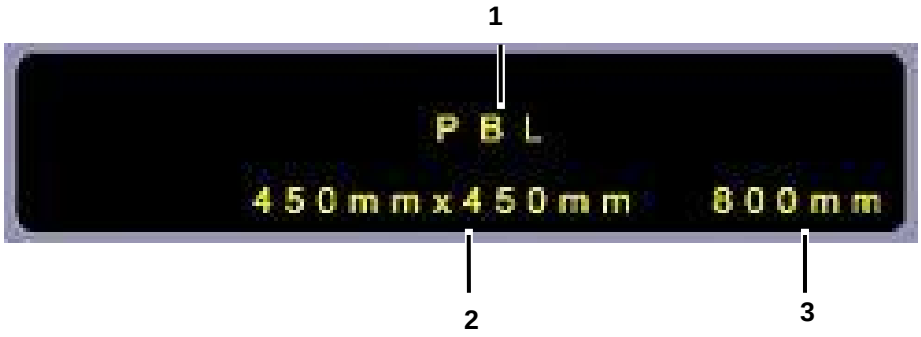
Note: ***The light field of the collimator shouldn't be larger than 17inch × 17inch @ SID=1m (43cm × 43cm).***

WARNING

IF THE LAMP OF THE LIGHT LOCALIZER REMAINS ILLUMINATED FOR A LONGER PERIOD OF TIME, THE HOLDER MAY HEAT UP. THE MAXIMUM ACCEPTABLE LIGHT ON/OFF RATIO IS 1 TO 1 (ONE MINUTE ON TO ONE MINUTE OFF).

7-8-2 Display

ILLUSTRATION 7-16
ECLIPSE PROTEUS COLLIMATOR DISPLAY



(1) Operating mode:

PBL = with automatic format collimation system
Manual = Without automatic format collimation system

(2) Display of width and height of collimated x-ray field

(3) Display of Source-Image Distance (SID)

WARNING

ELECTROSTATIC DISCHARGE MAY CAUSE THE DISPLAY ON THE FRONT OF THE COLLIMATOR TO GO BLANK. THE SYSTEM POWER MUST BE CYCLED VIA THE CONSOLE ON/OFF SWITCH TO RECOVER.

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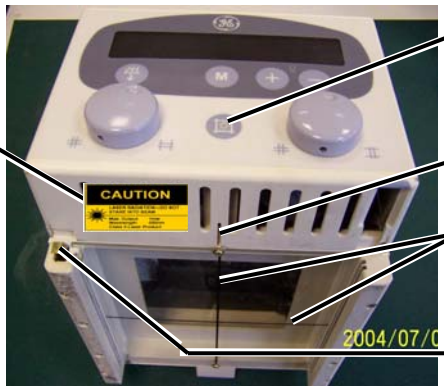
7-8-3 Bottom View of Eclipse Proteus Collimator

ILLUSTRATION 7-17
ECLIPSE PROTEUS COLLIMATOR BOTTOM VIEW



LASER warning label

On/Off switch (4 / Illustration7-15) for light localizer and Bucky centering light

Bucky centering light

Centering cross for positioning

Locking spring for accessories

Centering Cross

- The centering cross is used to indicate the longitudinal and transverse center of the exposure field on the cassette or directly on the patient.
- The light localizer for projecting the centering cross is switched on and off by pushing button (4 / Illustration7-15) on the control panel.
  - Automatic cutout is also performed via an internal time switch.
- The light localizer and Bucky centering light cannot be switched separately.
- Light field dimension check:

  Power on lamp by pushing the button (4 / Illustration7-15) on the control panel to make the light field visible. Use a ruler or tape to measure the height and width of light field.

Bucky centering light

- The bucky centering light provides the axis mark for longitudinal centering which is lined up with the centering mark on the handle of the cassette loading device.

  - Automatic cutout is also performed via an internal time switch.
- The bucky centering light, which is a laser beam, is switched on or off together with light localizer by pushing button (4/Illustratoin7-15) on the control panel.

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LASER Warning Label

Please pay attention to the LASER WARNING as follows.

WARNING

LASER RADIATION

PEAK POWER < 1MW / WAVE LENGHT 635NM / CLASS II LASER PRODUCT.

DO NOT STARE INTO BEAM!

WHEN YOU SWITCH ON THE LINEAR LASER LIGHT LOCALIZER, TAKE CARE THAT NO PERSON LOOKS DIRECTLY INTO THE LASER TO AVOID EYE INJURIES OR IMPAIRED VISION.

Accessory rails and Locking spring

- The Accessory rails provide a way to insert the compensating filters, template and cone, etc.

CAUTION

To ensure product safety use only accessories with the following specifications:

- **Maximum weight: 7 kg**
- **Plug-in metrics: width $177{,}5_{-0{,}5}$ mm**
  depth $177{,}5_{-0{,}5}$ mm

- The locking spring locks the inserted accessory in place to prevent them from falling out.
- To remove an accessory from the collimator, the locking spring must be pressed in before the compensating filter, templates etc., can be removed.

CAUTION

When applying the accessories such as compensating filters, templates and cone, please pay attention to ensure the accessories to be supported securely and reliably by the accessory rails.
Otherwise, the incorrect and unsafe insertion of the accessories may result in the falling down and lead to possible injure to the human body or instruments.

7-8-4 Rotating the Collimator ± 90° around the Vertical Axis

- Loosen the locking screw (1 / Illustration7-15) on the collimator to release the 0° lock-in position of the collimator.
- The max. rotated angle of collimator is ± 90°
- Grasp the collimator with both hands and rotate it by the desired angle to the required direction.

Rotating the collimator to the 0° lock-in position

- Grasp collimator with both hands and turn it to the 0° lock-in position.
- Tighten the locking screw (1 / Illustration7-15) on the collimator

WARNING

ALWAYS GRASP THE COLLIMATOR IN SUCH A WAY THAT HAND CAN BE NEITHER PINCHED NOR CRUSHED BETWEEN THE COLLIMATOR AND OTHER PARTS OF THE SYSTEM.

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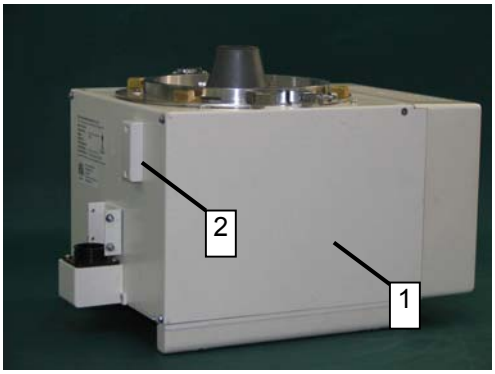
7-8-5 Replace Collimator Lamps Assembly

WARNING

ONLY THE LAMP OFFERED BY GEHL WITH THE HOLDER CAN BE USED AS REPLACED PART. OTHERWISE IT MAY CAUSE ISSUE OF LIGHT ILLUMINANCE, EDGE CONTRAST OR LIGHT/X-RAY FIELD ALIGNMENT.

- Removing the defective lamp assembly
  - Move the collimator right cover (1) and the shielding for lamp mounting hole (2).

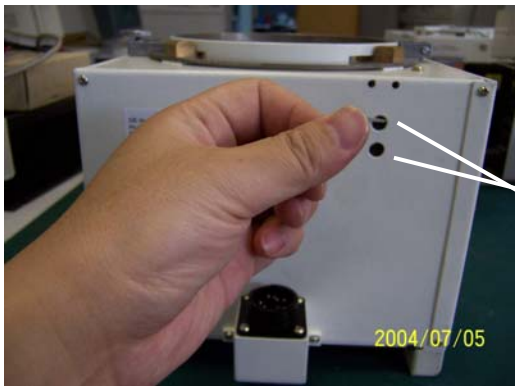


  - Unplug the connector of the lamp.

WARNING

IF THE LAMP OF THE LIGHT LOCALIZER REMAINS ILLUMINATED FOR A LONGER PERIOD OF TIME, THE HOLDER MAY HEAT UP. PLEASE AVOID TOUCHING THE LAMP HOUSING UNTIL IT COOLS DOWN.

  - Loosen 2 mouning screws of the lamp assembly from the hole on rear side of the collimator and remove the defective lamp assembly from the right side of the collimator



- Mounting the new lamp assembly
  - Mount the new lamp assembly
  - Reconnect the connector of the lamp
  - Mount the right cover of the collimator and the shielding for lamp mounting hole

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CHAPTER 8 PROTEUS XR/A WALL STAND COMPONENTS

8-1 Introduction

The wall stand (GPCP No.: 2260354) is defined as a Vertical Bucky/Stationary grid cabinet stand suitable for providing common off--table radiographic examinations. See Illustration 8-1.

The wall stand enables radiographic operation to be performed from different vertical positions within the range of the cassette movement.

- The height of vertical column is 2150mm.

- Bucky/Stationary grid cabinet travel distance is from 460-1710mm.

ILLUSTRATION 8-1
WALL STAND

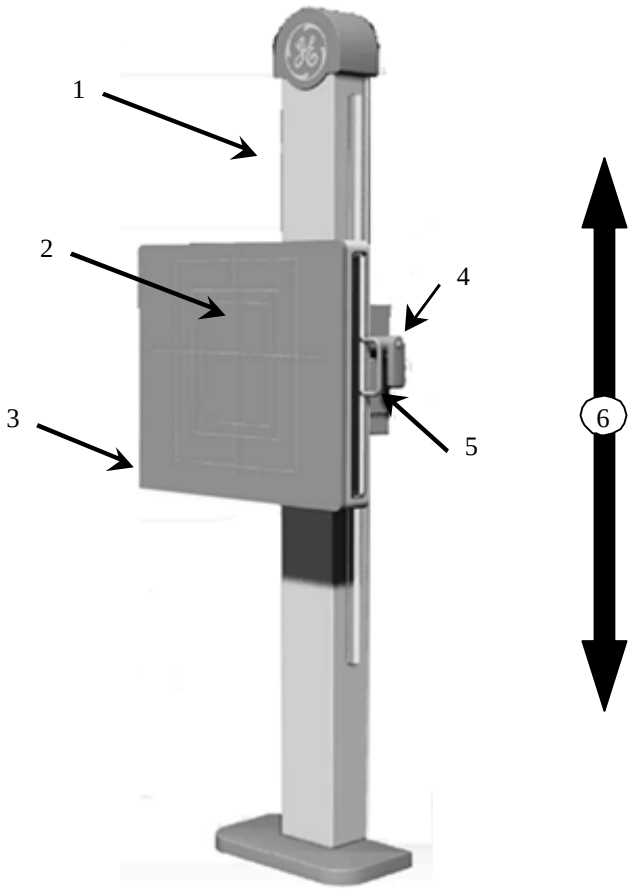

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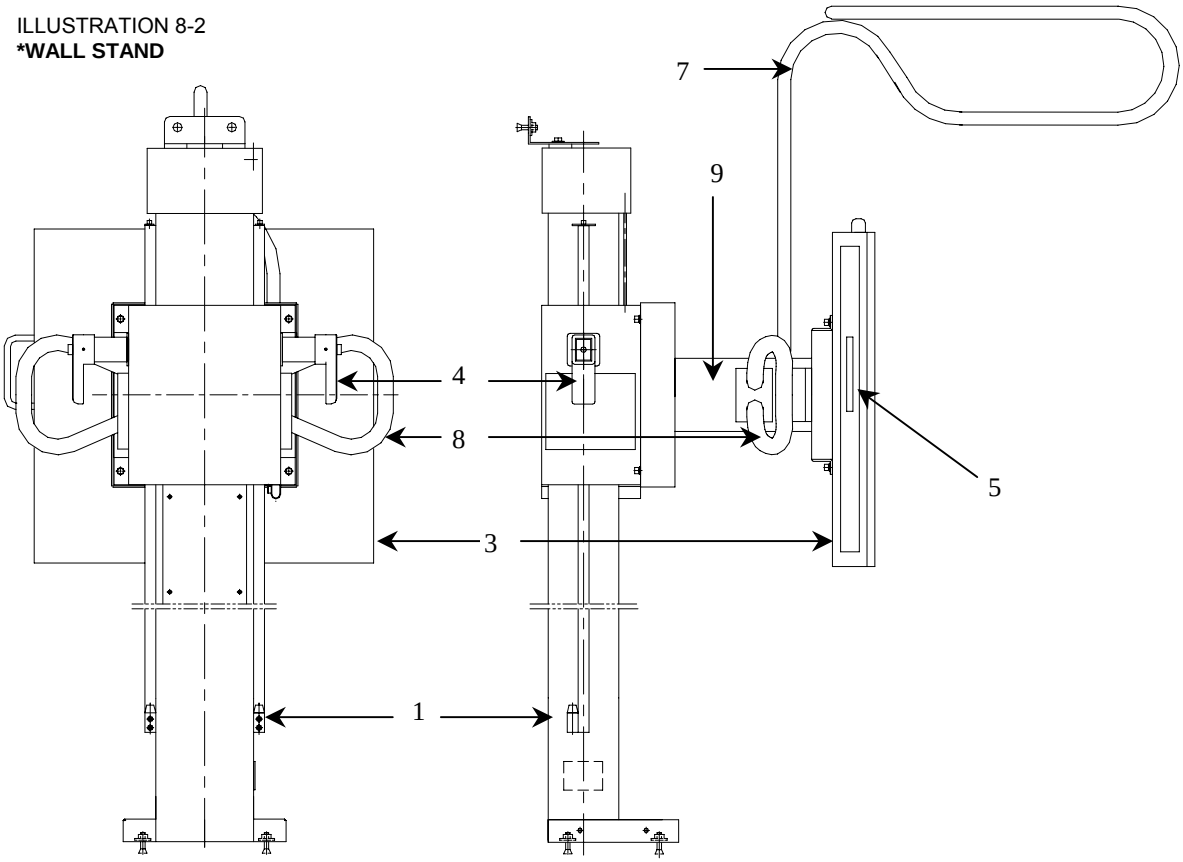
ILLUSTRATION 8-2
***WALL STAND**



1 Vertical Column
2 AEC Detector Areas
3 Bucky Film Cabinet
4 Vertical Lock Release
5 Cassette Tray
6 Vertical Motion
*7 LAT Grab Bar
*8 PA Grab Bar
*9 Knee Spacer

Note: ***The content with a star is only for the wall stand with a knee spacer.***

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8-2 Operation

8-2-1 Vertical Positioning

The Bucky/Stationary grid cabinet is held in vertical position by Electro-mechanical locks.

By operating the vertical lock handle (located on both left and right side of the Bucky carriage) the Electro-mechanical locks can be released and the carriage can be moved up and down, for infinite vertical positioning within its travel range.

Note: ***The Electro-mechanical lock of wall stand is a Power Off Protection Lock. The lock is negative without power on.***

8-2-2 Cassette Loading

This wall stand is equipped with cassette tray which is inserted into the Bucky tray slot.

1. To insert a cassette, pull the tray out of the Bucky to the tray stop.
2. Insert the shelf (See Illustration 5-2) in the centering scale slots that correspond to the cassette size selected.
3. Lift the clamping lock handle to unlock it.
4. Slide the clamping apart to insert a cassette on the shelf. Clamp and center the cassette transversely on the tray.
5. Push the clamping lock against the cassette and lock it by pressing down the lock handle.
6. Push the cassette tray all the way into the Bucky.

Note: ***If select "Wall Stand" as the image receptor on System Console (refer to section "5-3-1 Technique Selection" in Chapter 5) when taking exposure either with or without AEC, the cassette tray must be inserted all the way into the Wall Stand Bucky. If the cassette tray is not inserted all the way into the Bucky, the exposure will be prohibited either with or without AEC.***

Note: ***To prevent damage to the cassette clamps locking assembly always close it prior to inserting (pushing) the cassette tray into the Bucky.***

Note: ***Normally the cassette tray does not have to be completely removed from the Bucky in order to load a cassette. Cassette may be inserted in the tray by pulling the tray until movement is stopped by the catch on the lower rear of the tray.***

However, if it is desired to remove the tray from the Bucky, pull the tray out until it is stopped by the catch, then press the catch against the tray bottom and hold it while sliding the tray out.

WARNING

IT'S A TWO-HAND OPERATION BUCKY. PLEASE BE CAREFUL WHEN YOU LOADING / UNLOADING THE CASSETTE. YOU HAVE TO USE ONE HAND FOR LOADING, AND THE OTHER HAND TO LIFT THE CLAMPING LOCK HANDLE TO UNLOCK IT.

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8-2-3 LAT Bar Angulation

Release the handle, then, turn the LAT bar to the position in which the keys on the flange insert the slots on the spacer. Then, lock the handle.

WARNING

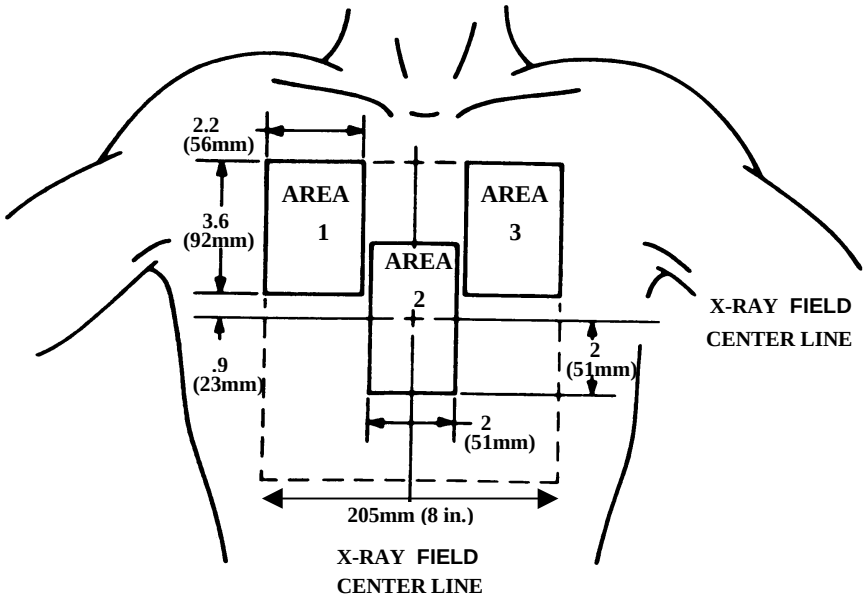
THE LAT BAR IS NOT USED FOR HOLDING WHOLE PATIENT'S WEIGHT.

THE MAXIMUM FORCE ON THE LAT BAR SHALL NOT EXCEED 20 KG.

8-2-4 AEC Detector Areas-Optional Feature

The optional ion chamber in the wall stand contains three sensing areas. The square areas in Illustration show the location of the three ion chamber areas.

ILLUSTRATION 8-3
POSITIONING OF ION CHAMBER DETECTORS



THE POSITION OF THE SENSING AREAS

- Sensing area Number 2 is at the center of the x-ray beam.
- Area Number 1 and Area Number 3 can be selected to cover an exposure of two symmetrical parts of the body at a time, such as the lungs or the kidneys.
- If this is the case, care should be taken to center the patient and detector areas accordingly.

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8-2-5 Applications for Detector Areas

Applications for the detector areas are given in Table 5-1

For example, one application for the ion chamber detector is chest radiography.

- In this application area 1 and area 3 must be located in line with radiation transmitted through the left and right lung fields, so that areas 1 and 3 are not influenced by variations in tissue opacity caused by the heart or vertebrae.

  If the patient is improperly positioned and the sensing areas are exposed to direct radiation, the phototimed exposures will be too short and the films underexposed.

  The opposite will be true if the patient's thoracic spine or sternum is positioned over the sensing areas.

- The basic positioning requirements are also important when using area 2. Misalignment may result in unusable film. Therefore, care should be taken when positioning the area of interest over area 2.

  1. Before positioning the patient, align the x-ray tube to the center of area 2.
  2. Collimate the light field to an area of 205mm-230mm. This light field is now cen-tered on area 2 and encompasses two sides of areas 1 and 3. See Illustration 8-3.
  3. Position the patient's area of interest within the light field. Readjust the light field to the desired size. The detector sensing area is now aligned with the patient area of interest.

- When using area 2 only, a light field (51mm-102mm), if properly centered, will define that area and can be used to align a particular body portion with it.

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CHAPTER 9 PROTEUS XR/A SG120 WALL STAND COMPONENTS

9-1 Safe Operation Precautions

WARNING

THIS EQUIPMENT SHOULD ONLY BE USED BY QUALIFIED PERSONNEL AND ONLY AFTER A COURSE IN THE SPECIFIC OPERATION AND FUNCTIONALITIES OF IT.

WARNING

IT IS THE RESPONSIBILITY OF THE OPERATOR TO ENSURE THE SAFETY OF THE PATIENT WHILE THE MACHINE IS IN OPERATION BY CHECKING PROPER PATIENT POSITIONING AND USING THE EQUIPMENT PROTECTIVE DEVICES.

WARNING

CHECK CAREFULLY THAT THERE ARE NOT INTERFERENCES NEITHER COLLISION POSSIBILITY BETWEEN THE PATIENT AND OTHER DEVICES.

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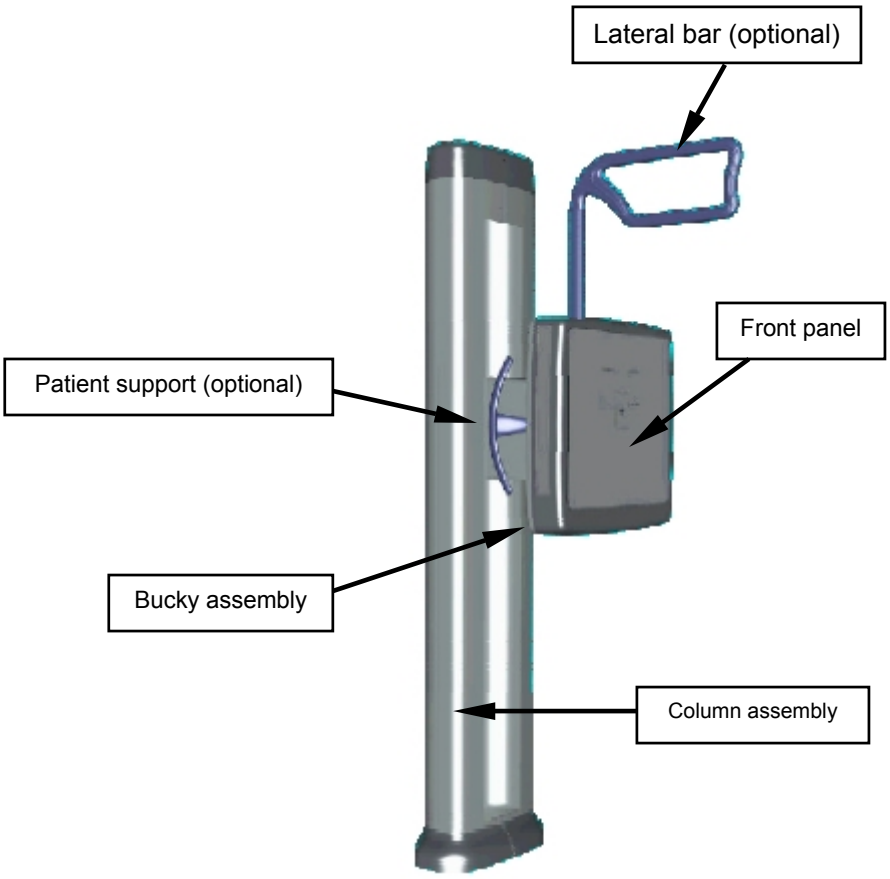
9-2 Introduction

The SG120 (GPCP No.: 2402562) is defined as a Vertical Bucky Stand suitable for providing common radiographic examinations, including chest films and oblique angle radiography. With the right choice of x-ray tube supports, tubes and generators, the SG120 is able to provide vertical and horizontal off-table radiography.

The tilting/rotating functionality is available.

Lateral bar and patient support are optional.

Illustration 9-1
SG120 WALL STAND



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9-2-1 Column Assembly

The column assembly includes the next main parts:

- Bucky support assembly: joins the column assembly to the bucky assembly means of the vertical carriage that moves along the guide on the column. Includes the vertical lock handle to control the vertical movement of the bucky assembly.
- Covers: give the final appearance to the equipment.
- Counterweights: permit to counterbalance the bucky assembly to enable it can be moved smoothly along the vertical direction.
- Column Stand: it is the main part of the column assembly, and it is fixed to the floor and is in charge to hold all the elements.
- Main cabling and electronic devices: in the column assembly are located the equipment cables and electronic boards.

9-2-2 Bucky Assembly

Includes the bucky, which is mounted to the bucky support behind the front panel. Includes a cassette tray, suitable for all standard cassette sizes.

In the bucky assembly are also located other parts, such as the grid (optional) and the ion chamber, used for AEC exposures.

9-2-3 Front Panel

Includes a carbon fiber manufactured barrier of dimensions 562×510×3, with an absorption of maximum 0.9mm Al measured at 100KVp.

9-2-4 Vertical Lock handle

The vertical lock handle enables to displace the bucky carriage holding the bucky assembly along the column stand.

The vertical lock handle is left-right field configurable.

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9-3 Applications

The SG120 vertical Bucky stands are designed specifically to handle a full range of applications, from emergency procedures to routine radiographic studies. Their smooth vertical travel enables a wide range of examinations with the patient standing or sitting.

The SG120 offers great versatility with a tilting panel, controlled with electromagnetic brakes, for angulation examinations.

The next accessories are available for use with SG120:

- Patient Support Kit (Lateral Bar and Patient Grip) to provide user support during exposures.
- Manual Hanging Cassette Holder to allow table-top exposures on vertical bucky stand.
- SG120 vertical bucky stands comply with all standard medical regulations (UL, 21CFR, CSA, NRTL/C, CE, IEC)

9-4 Operation

9-4-1 Vertical Positioning

The SG120 remains locked in its vertical position when the equipment is switched ON thanks to the electromagnetic vertical brakes.

Procedure:

1. Press the key on the vertical lock handle.
2. Check that the brakes are released and the bucky assembly can be displaced smoothly along the vertical direction.
3. Set the bucky assembly at the desired height, depending on the study to be performed.
4. Release the key on the vertical lock handle and check the bucky assembly remains locked in the desired position.

Note: ***The vertical lock handle is located on the LEFT side behind the bucky assembly, but this configuration can be easily field configured if needed. See Service Manual for details on LEFT to RIGHT configuration change.***

Functionalities:

Min. height from floor:

- Horizontal position: 63.5 cm (25 in)
- Vertical position: 33 cm (13.1 in.) centre of the bucky

Max. height from floor:

- Horizontal position: 213 cm (83.9 in.)
- Vertical position: 190.5 cm (75 in.) bucky centre

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9-4-2 Cassette Loading

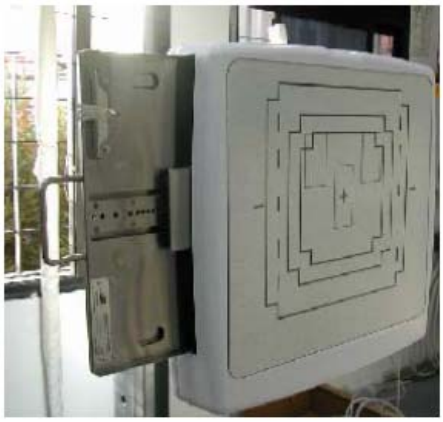
The SG120 is equipped with a cassette tray, suitable for all standard cassette sizes, that is manually inserted in the bucky assembly.

Note: ***It's a two-hand operation cassette tray.***

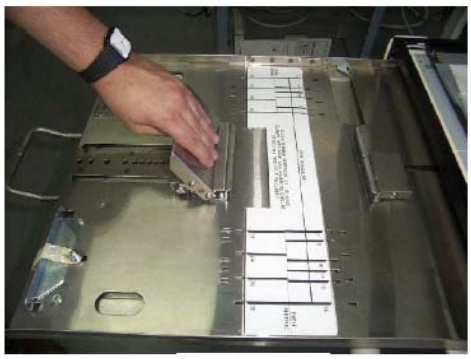
Note: ***The SG120 is LEFT configured for cassette loading but his configuration can be changed if needed. See Service Manual for details on LEFT to RIGHT configuration change.***

Procedure

1. Extract the cassette tray pulling by its handle.



2. Open cassette-clamp locking assembly. Spread out and separate the clamps.



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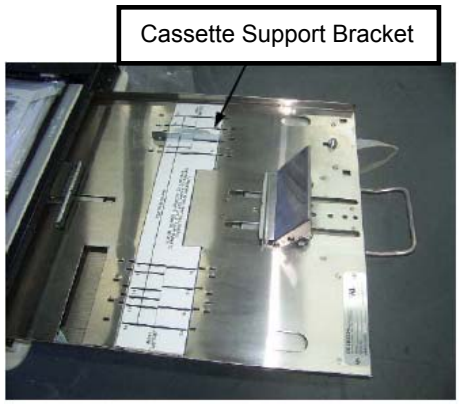
3. Insert the cassette support bracket into the appropriate holes.



4. Insert the cassette between the cassette clamps, resting it on the cassette support bracket, Reposition the clamps against the cassette and close the cassette-clamp locking assembly.

5. Insert the cassette tray into the bucky tray slot.

WARNING

TO AVOID THE CASSETTE-CLAMP LOCKING ASSEMBLY CAN BE DAMAGED, ALWAYS CLOSE IT BEFORE INSERTING THE CASSETTE TRAY INTO THE BUCKY TRAY SLOT.

WARNING

USE CAUTION TO AVOID CASSETTE SENSING ARM DEFORMATION. ITS SHAPE IS IMPORTANT TO OBTAIN ACCURATE FIELD PLACEMENT. IF THE ARM IS DAMAGED, IT HAS TO BE REPLACED. DO NOT TRY TO REPAIR THE ARM IN CASE IT BECOMES DEFORMED.

Note: ***Normally, it is not needed to remove completely the cassette tray from the bucky in order to load a cassette.***

Cassettes may be inserted in the tray by pulling the tray until movement is stopped by the catch on the lower rear of the tray.

Note: ***Even if it is not needed, if it is wanted to remove totally the cassette tray from the bucky, just pull the tray out until it is stopped by the catch (located on the upper or lower side of the tray depending if the SG120 is left or right tray nsertion configured), then press the catch to the bottom of the tray and keep it pressed while you slide carefully the tray out of the bucky assembly.***

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9-4-3 Cassette Removal

Note: ***It's a two-hand operation cassette tray.***

Procedure

1. Extract the cassette tray pulling by its handle.
2. Pull up the tightening lever and remove it from the cassette, which remains free.
3. Remove the cassette.

9-4-4 AEC Detector Areas

The SG120 may operate with an Ion Chamber Detector. The three field pattern on the front panel of the SG120 corresponds to the three detection areas for the Ion Chamber Detector.

9-4-5 Alignment

It is important that the X-ray tube is accurately centered with the Bucky transversely. If the alignment is not accurate, density cut-off at the edges of the film and appearance of grid patterns may be found.

The alignment is not critical when an anti-diffusion grid is used. In this case, tilted tube techniques may be used without undue cut-off.

Note: ***The cassette tray handle is marked to indicate the vertical center of the bucky. To assure the bucky is vertically aligned with the X-ray beam, move the bucky or the tube in order the collimator light is aligned with this center mark.***

9-4-6 Frontal Panel

The bucky assembly mechanism and grid can be easily accessed by removing the front panel of the SG120. Loosen the screws that hold the front panel to the bucky support and remove it with care.

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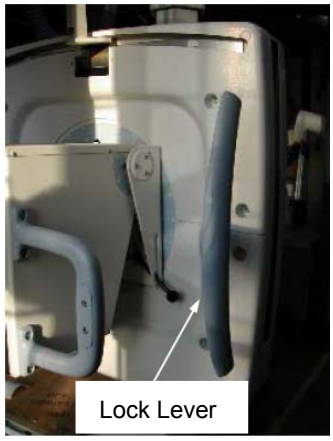
9-4-7 Bucky Rotation

It is possible to rotate the SG120 bucky assembly SG120 from 0º to 180º. The rotation movement is permitted means of the lock lever located on the back side of the bucky assembly.

Procedure

1. Release the lock lever.



2. Rotate the bucky to position.

Rotation Movement

3. Put the lock lever back into locked position.

Note: ***The bucky can be rotated CW (clockwise) or CCW (counter-clockwise).***

Note: ***To avoid degradation of image quality and loss of bucky functionality, it is recommended not to perform exposures with the bucky in other position than 0º or 180º.***

The bucky is designed to operate only at 0º or 180º positions, but will function in a range within 30º of these positions. The image quality may be degraded, however.

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9-4-8 Bucky Angulation

The SG120 bucky assembly can be angulated in a range that varies from –20° to 90°. The bucky in locked means of the electro-mechanical detents located in the bucky support assembly. The angulation movement is left free when activating one of the pushbuttons located behind the bucky support.

Procedure

1. Press one of pushbuttons located behind the bucky support.

Angulation pushbuttons (one on each side)

2. Keeping the pushbutton pressed, angulate the bucky to the desired position.

Angulated Bucky (90° position)

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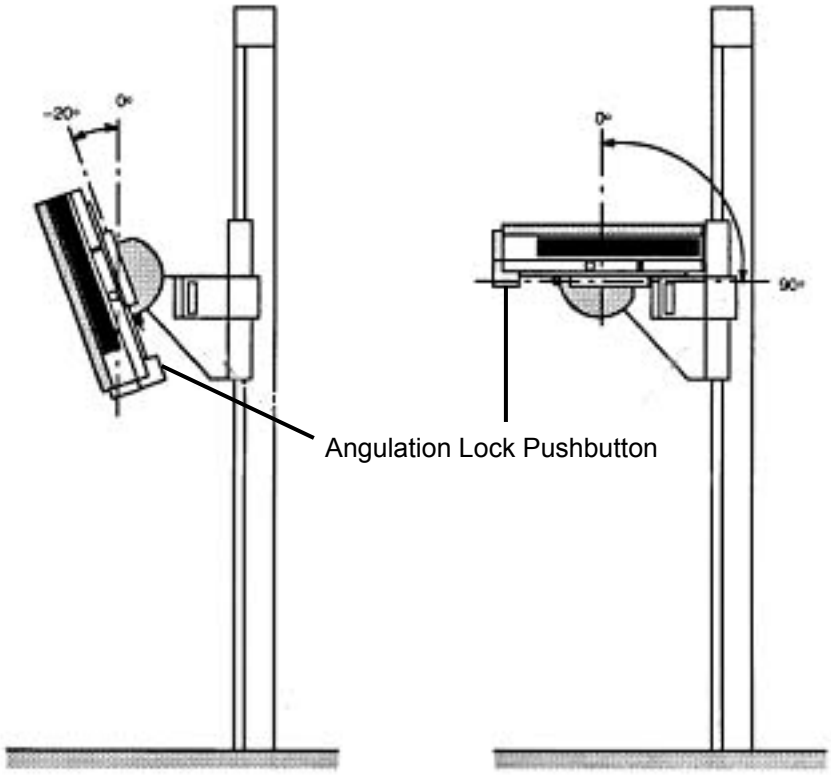
3. Release the pushbutton in order the bucky to remain locked.

Illustration 9-2



BUCKY ANGULATION

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9-4-9 Auto Exposure Control Requirements

Note: ***For SG120 Wall Stand Auto Exposure Control (AEC), please check the form below to ensure the fulfillment of each item of AEC requirements. Otherwise, the exposure operation will cannot be made under AEC.***

For SG120 Wall Stand, there are two circumstances (Bucky is in vertical position and Bucky is in horizontal position, refer to Illustration 9-2) under which the AEC exposure can be made. And in the form below, The AEC exposure requirements under these two circumstances are specified respectively. Pay attention to distinguish these two sets of requirements.

Note: ***For SG120 Wall Stand, to take exposure under AEC, the Cassette must be loaded in the tray, and the Cassette tray must be inserted all the way into the Bucky. And the image receptor must be selected to be "Wall Stand" on System Console (refer to section "5-3-1 Technique Selection" in Chapter 5).***

For SG120 Wall Stand, if the cassette is placed on the top of the Bucky (Bucky is in horizontal position, Angulation is 90°, see illustration 9-2) while not be loaded in the tray and inserted into the Bucky together with the tray, the exposure only can be taken without AEC. And the image receptor should be selected to be "Table top" on System Console (refer to section "5-3-1 Technique Selection" in Chapter 5).

For SG120 Wall Stand, if the tray is not inserted all the way into the Bucky, the exposure will be prohibited either with or without AEC.

Note: ***For the vertical position, rotation and angulation of SG120 Bucky, please see contents 9-4-1, 9-4-7 and 9-4-8 for references. For OTS Console position and Collimator override switch on OTS Console, please see 7-3, 7-4-3 and 7-5 in Chapter 7. For Image Receptor Mode chosen on System Console, refer to 5-3-1 in Chapter 5.***

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Bucky Angulation	Collimator override switch on OTS Console	Image Receptor Mode chosen on System Console	Bucky position		OTS Console position				Source-to-Image Distance (SID) (preset by service engineers)
			Rotation	Vertical position	Tube angle	Alignment with Wall Stand Bucky	Longitudinal position	Vertical position	
1.Bucky is in vertical position, deviation within ±10°	Ensure the switch to be on the AUTO mode	Wall Stand	0° or 180°	Any position within vertical traveling range (Top edge of Bucky in vertical position: from 24.57" (624mm) to 72.60" (1844 mm)).	90°±10°, -90°±10°	Position at OTS transverse detent for Wall Stand centerline	Position at OTS longitudinal detents for Wall Stand	Aligned with SG120 Bucky using Collimator light field	SIDs (Position with OTS longitudin-al detents for Wall Stand when taking AEC exposure)
2. Bucky is in horizontal position, deviation within 10°	Ensure the switch to be on the AUTO mode	Wall Stand	0° or 180°	Position by High/Low Auto Exposure position detents on SG120 Wall Stand	0°±10°	Position at OTS transverse detent for Wall Stand centerline	Aligned with Wall Stand Bucky using Collimator light field	Position at OTS High Auto Exposure position detent when SG120 Bucky position at High Auto Exposure position, OTS Low Auto Exposure position detent when SG120 Bucky position at Low Auto Exposure position	High/Low Auto Exposure position SID (Position with OTS High/Low Auto Exposure position detent)

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CHAPTER 10 ACCESSORIES

10-1 Introduction

The following accessories are available with Proteus XR/a Systems:

- Abdomen Compression Band
- Patient Hand Grips
- Collimator Cone

WARNING

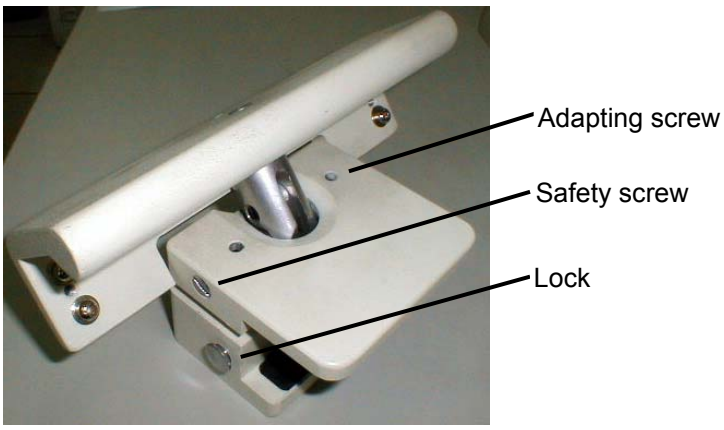
FOR CONTINUED SAFE USE OF THIS EQUIPMENT, USE ONLY MANUFACTURER RECOMMENDED ACCESSORIES

WARNING

ACCESSORIES SHOULD BE PROPERLY ATTACHED TO THE TABLE AND POSITIONED SO AS NOT TO INTERFERE WITH SYSTEM MOTIONS.

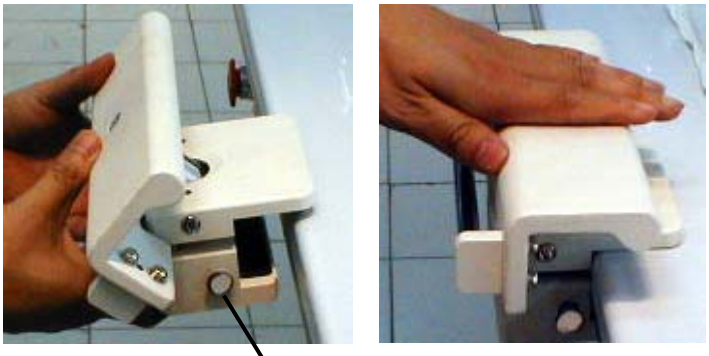
10- 2 Accessories

10-2-1 Abdomen Compression Band



Installation:

1. Depress the lock, then release clamp.
2. Position the clamp, then depress the handle.
3. Fasten the compression band.



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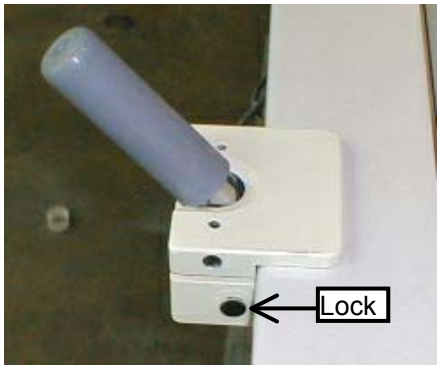
10-2-2 Patient Hand Grips

The patient hand grip installation is as same as compression band clamp.

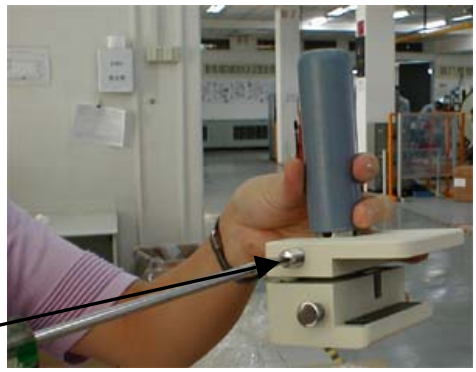
Lock the Hand Grip



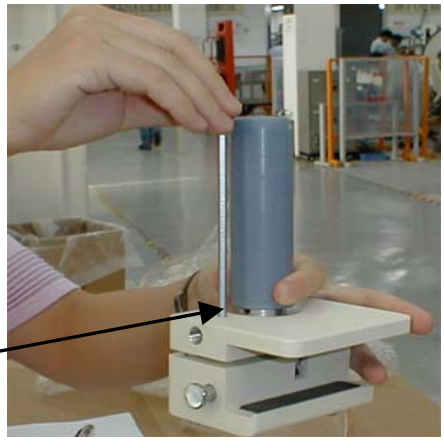
Release the Hand Grip

10-2-3 Adjusting

1. Depress the lock, then release clamp or grip.
2. Position the clamp or grip, then depress the handle.
2. Release two safety screws.



4. Use M2.5 Alien key adjust two adapting screws until clamp is firmly attached to table top.
5. Fasten safety screws.



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10-2-4 Collimator Cone

Note: ***The purpose of the collimator cone is to collimate the beam and image to a cylinder shape when doing certain procedures. Mainly used for sinuses, head, hip etc.***

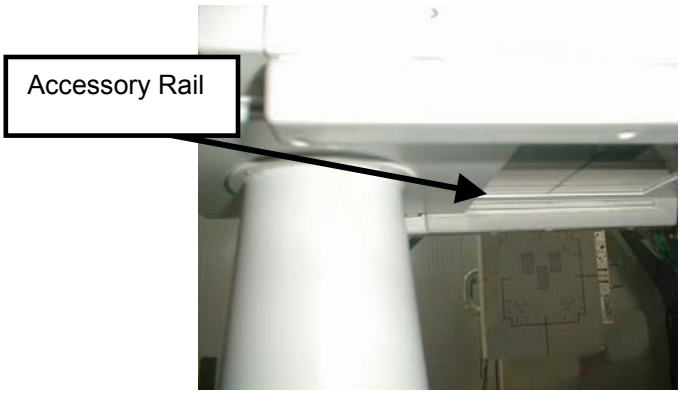
Procedure of attach and removal:

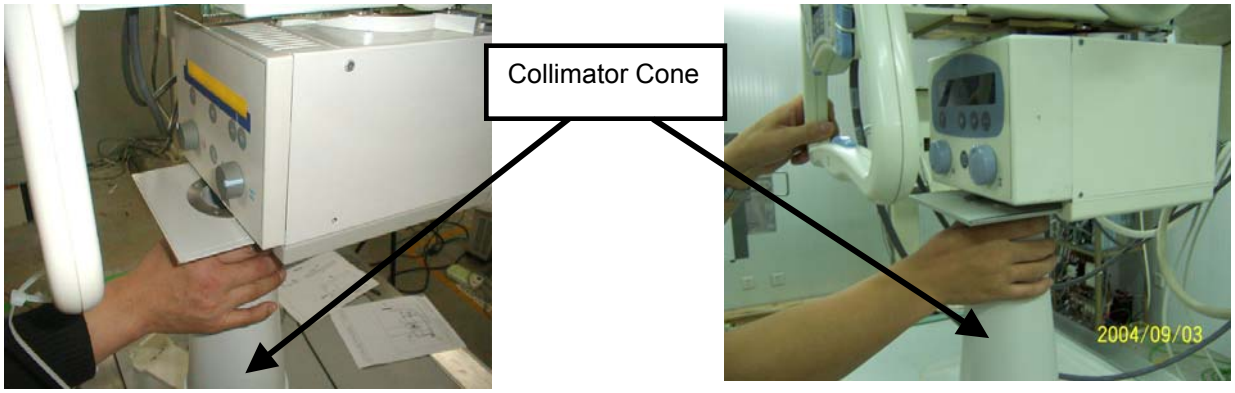
1. Insert the edge of the collimator cone into the Accessory Rails beside the collimator window.

CAUTION **Insert collimator cone into the upper accessory rail.**

Note: ***Adjust the alignment of the collimator cone with the collimator to ensure the concentricity of the collimator cone and collimator window.***

CAUTION ***When taking exposure using the collimator cone, pay attention to choose*** **correct cassette size to avoid the X-ray field from beyond the film size.**





Proteus XR/a Collimator

Eclipse Proteus Collimator

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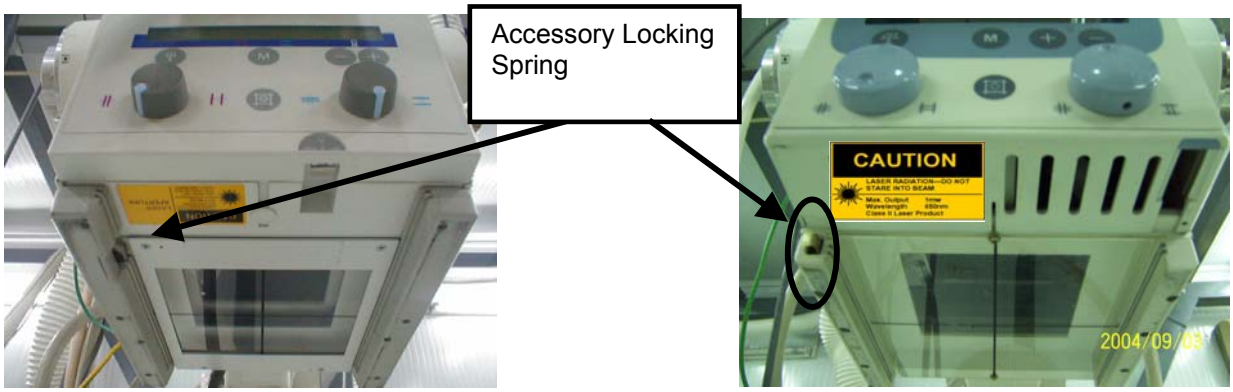
2. For removal, push in the Accessory Locking Spring and remove the collimator cone.



Proteus XR/a Collimator

Eclipse Proteus Collimator

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CHAPTER 11 PLANNED MAINTENANCE

11-1 General

To assure continued performance of this x-ray equipment, a periodic inspection program must be executed.

The Proteus System does not require any Planned Maintenance activities for the first 13 months after system installation.

Functional Checks will not indicate that this x-ray system is performing to specifications. Only regular periodic maintenance can locate potential problems. It is the owner's responsibility to supply or arrange for this service.

11-2 HHS Testing

The United States Department of Health and Human Services (HHS) has established performance requirements for diagnostic x-ray equipment. These requirements are defined in Title 21 of the Code of Federal Regulations (21 CFR), and apply only to certain specified components identified as "certified equipment."

The manufacturer of specified diagnostic x-ray components must certify that the components:

1. Perform as required by the HHS standard when installed, adjusted, and tested as specified in the manufacturer's instructions to the assembler.
2. Will continue to comply when maintained in accordance with the manufacturer's instructions.

Descriptions of HHS testing are provided in a separate manual (not available at this time), supplied with the equipment.

11-2-1Cleaning and Disinfecting

This equipment should be cleaned frequently, particularly if corroding chemicals are present. Use a cloth moistened in warm soapy water (use mild soap) to clean the trim and nameplate of the Operator's Controls. Wipe with a cloth moistened in clean water. Do not use cleaners or solvents of any kind as they may dull the finish or blur the lettering. Polish with a pure liquid or paste wax. Other surfaces of the equipment can be cleaned using a clean cloth moistened slightly with a good mild cleaner and polish acceptable for use on enamelled metal surfaces.

Before each use, equipment surfaces that contact the patient should be cleaned with an EPA registered, low-level disinfecting or sanitising agent.

On the console, clean the frame and the mylar surface with a lint-free cloth moistened with alcohol. DO NOT:

1. Use alkaline products.
2. Place objects on the mylar surface which are likely to cause scratches.
3. Use the console to write on.

WARNING

IN THE EVENT OF EQUIPMENT CONTACTING BROKEN SKIN OR BEING USED WITH INFECTED OR IMMUNE COMPROMISED PATIENTS, THE EQUIPMENT SHOULD BE CLEANED USING FDA CLEARED AND EPA REGISTERED HIGH-LEVEL DISINFECTING AGENTS. CIDEX LIQUID CHEMICAL GERMICIDE IS RECOMMENDED FOR THIS PURPOSE.

Note: ***Be sure to follow the label instructions and pre-cautions for use, storage, and disposal of all disinfecting agents.***

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11-3 Qualified Service

Safe equipment performance requires the use of service personnel specially trained on medical X-ray apparatus. General Electrical System and its associates, maintain a worldwide organisation of stations from which to furnish periodic and/of emergency service on a contract basis. A GE representative will be glad to discuss this plan.

General Electric X-ray equipment contains operation safeguards designed to provide maximum safety. Before calling for service, be certain proper operation procedures are being used.

11-4 Periodic Maintenance

FAILURE TO PERFORM THE PERIODIC INSPECTION AND MAINTENANCE COULD ALLOW DETERIORATING CONDITIONS TO DEVELOP WITHOUT BEING DETECTED. THIS DETERIORATION COULD RESULT IN EQUIPMENT FAILURES WHICH COULD CAUSE SERIOUS INJURY OR EQUIPMENT DAMAGE.

ELECTRIC SHOCK HAZARD! THE PROTEUS XR/A SYSTEM CONTAINS NO USER SERVICEABLE COMPONENTS. DO NOT ATTEMPT TO DISABLE THESE COMPONENTS OR REMOVE ANY TRIM COVERS. REFER SERVICE TO QUALIFIED SERVICE PERSONNEL.

Planned Maintenance is required for continued safe operation. Planned Maintenance should be performed as specified in the Maintenance Schedule of the Service Manual by qualified personnel.

Inspection intervals are based on average daily use of one eight hours shift. More frequent inspection is appropriate where equipment use is above average.

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TABLE 11-1
PLANNED MAINTENANCE

MAINTENANCE ITEM	FREQUENCY (MONTHS)	PROCEDURE
GENERAL		
Visual inspection	12 months	Check for debris that would indicate abnormal wear.
General cleaning and painting	As required	See section 11-2-1
Functional checks	12 months	Perform tasks described in Proteus XR/a Service Manual.
TABLE BASE		
Telescopic covers	12 months	Check conditions and cleans.
Control pedals and movement inhibition buttons	12 months	Check condition and functioning. Ensure pedals and buttons have free play without any obstruction.
SID display meter	12 months	Check the SID display shows the real SID.
Electrical Cables	12 months	Check conditions of cable sheathing and correct routing.
Power and ground connections.	12 months	Check condition and connections.
Connector panel and cable connectors.	12 months	Check condition and connections.
TABLE TOP		
Surface finish.	12 months	Check conditions and cleans.
Longitudinal bearings and wheel bearings.	12 months	Check condition. Lubricate with molylithium grease.
Longitudinal bearing tracks and rails.	12 months	Clean and wipe with light machine oil or WD40.
Transversal rods and bearings.	12 months	Clean condition, Clean and wipe with light machine oil. Lubricate with molylithium grease.
Rubber bumper end stops (Longitudinal & transversal)	12 months	Check condition of stops and tightness of anchoring.
CASSETTE TRAY AND CARRIAGE		
Grid oscillating mechanism.	12 months	Check that movement is not obstructed.
Electrical connector and cable.	12 months	Ensure connector is in good condition and making good contact. Check condition of cable sheathing.
Cassette handle assembly, push button and hand holder.	12 months	Ensure handle and push button has free play without any obstruction.
Bearings and tracks (front and rear)	12 months	Check condition. Clean and wipe with light machine oil. Lubricate with molylithium grease.
Rubber bumper end stops.	12 months	Check condition of stops and tightness of anchoring.
Tray	12 months	Check general condition of the tray.
Cassette size marker and locking assembly.	12 months	Check condition. Clean and wipe with light machine oil.
Electrical connector and cable.	12 months	Ensure connector is in good condition and making good contact. Check condition of cable sheathing.

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OVER HEAD TUBE SUSPENSION		
Rail Stand Tracks	12 months	Lubricate tracks with cloth slight moistened with light oil.
Visual Checks and Operational Tests	12 months	Inspect and replace or repair as required: • Loose hardware, loose wires, or shorted electrical terminals • Ground connections • High tension cable connections at X-ray tube and high voltage transformer • Worn external cables and wires • Bearing surfaces for cleanliness/corrosion • Worn or damaged parts • Steel aircraft cables Perform operational tests
Replacement	8 years	• Safety Reel and Cable (Complete safety reel assembly). Reference to OTS Suspension Service Manual chapter 4, Service Procedure.
COLLIMATOR		
Maintenance Checklist	12 months	Perform calibration procedures: • X-ray field vs. indicated size • X-ray field and receptor alignment • Beam alignment • Cross hairs to light field alignment • Bucky light line alignment (auto only) • Lubrication
Mounting Hardware	12 months	Check tightness of collimator mounting bolts.
Lubrication	12 months	Lubricate all moving parts
ACCESSORIES		
Compression Band	12 months	Check condition.
Patient hand grips	12 months	Check condition.
Collimator Cone	12 months	Check condition
WALL STAND (GPCP No.: 2260354)		
Visual inspection	12 months	Check for defects that would indicate abnormal wear.
General cleaning and painting.	As required.	See section above.
Functional Checks	12 months	Perform tasks described in Proteus XR/a service manual.
SG120 WALL STAND (GPCP No.: 2402562)		
Visual inspection	18 months	Check for defects that would indicate abnormal wear.
General cleaning and painting.	As required.	See section above.
Functional Checks	18 months	Perform tasks described in Proteus XR/a service manual.

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MECHANICAL		
Counterweight chain	18 months	Inspect and grease length of chains. Replace if excessively rusty.
Carriage Roller Bearing inspection.	18 months	Clean roller bearings and tracks.
Vertical lock.	18 months	Lock notched rail. General cleaning. Functional check according to service manual.

11-5 Recycling

Packing Materials:

The materials used to pack our equipment are recyclable. They must be collected and processed in accordance with the regulations in force for the country where the machines or accessories are unpacked.

Machines or Accessories at end-of-life:

The elimination of machines and accessories must be in accordance with national regulations for waste processing. All materials and components that could pose a risk to the environment must be removed from the machines at end-of -life and accessories (examples: dry and wet cell batteries, transformer oil, etc.).

Please consult your local GEMS representative before discarding these products.

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CHAPTER 12 SYSTEM FAULTS

12-1 Introduction

Refer to this section for assistance in locating and correcting minor system faults, should they occur.

The majority of these faults can be corrected without a service technician. Refer to the Proteus XR/a Service Manual for system faults that require the attention of a service representative.

12-2 General Trouble Shooting

12-2-1 Faulty Operation

Refer to Table 12-1. The errors in Table 12-1 are only a portion of the errors that may occur.

Although the Proteus XR/a Generator is designed, manufactured and checked to the highest GE standards, certain instances of faulty operation may occur during its use.

Faulty operation may be due to:

- **Internal cause:**
  Component deterioration,
  Connection degradation,
- **External cause:**
  Faulty communication with another piece of equipment in the x-ray room
  Severe interference from the mains power line supply

Faulty operation may occur while the system is inoperative, or during radiography exposure.

Proteus XR/a Generator operation is constantly being monitored by its microprocessor to:

- Detect faulty operation,
- Warn the operator,
- Avoid useless exposure to the patient.

The consequence of faulty operation detected by the Proteus XR/a Generator

- The equipment is inhibited, making exposure impossible,
- Key flashes,
- Parameter display clears and is replaced by a 2 or 3 digit error code and also displays messages for operator action.
- Sometimes, the lights and a buzzer sounds on the console.

What to do step by step:

- Find the root cause by referring to Table 12-1.
- Press the reset Key
- Make one attempt to continue the current exam
- The faulty operation should disappear. If it reappears, stop the exam immediately. Call GEMS Service giving the error code displayed and the circumstances under which it occurred.

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12-2-2 Operator Errors

Operator errors are detailed in Table 12-1.

Errors may be due to:

- Inadequate parameter selection
- Inadequate AEC cell choice
- Collimator blades excessively closed or excessively open
- Premature release of exposure switch
- Door of x-ray room open

The consequences of an operator error detected by the Proteus XR/a Generator are:

- Equipment inhibited, making exposures impossible
- Warning light and buzzer activated

What to do step by step:

- Find the root cause by referring to Table 12-1.
- Press the reset Key
- Make one attempt to continue the exam
- The faulty operation should disappear.

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Table 12-1
TROUBLESHOOTING: FAULTY OPERATION & OPERATOR ERRORS

Cause	Circumstance	Type of error	Cause	Corrective action
Tube light lit	Following intensive use	Operator error	1) Working rate too high 2) Select kV too low	1) Reduce work rate 2) Use higher kV Values 3) Wait for tube housing to cool before continuing
Inhibition light flashing	At any time	Operator error	X-ray room door open	Close the x-ray room door
Inhibition light lit together with flashing of parameter	During rad parameter change operation	Operator error	Parameter too high or too low	Modify mAs, mA or ms values as indicated by back lighting
Inhibition light lit together with flashing of parameter	Following a series of exposures	Operator error	Work rate too high-incompatible with selected parameters	1) Wait indicator goes out to resume work 2) Reduce mAs, mA and ms parameters or reduce work rate
Reset key flashes with buzzer, no error code	Exposure underexposed	Operator error	Exposure button released before end of exposure	Cancel inhibit by pressing Reset key and start exposure again
Reset key flashes with buzzer, no error code	Exposure underexposed	Sporadic faulty operation	Interference	Cancel inhibit by pressing Reset key and record occurrences and call field service
Reset key flashes with buzzer, no error code	After exposure in AEC mode: exposure overexposed	Operator error	Collimator shutters too closed, thereby covering measurement cell	1) Open collimator or change measurement cell selection 2) Cancel inhibit by pressing Reset key
Reset key flashes with buzzer, error code replacing rad parameter	At power-up or before exposure	At power-up or before exposure	Various	1) Record error code 2) Cancel inhibit by pressing Reset key
Reset key flashes with buzzer, error code replacing rad parameter	During exposure	Faulty operation	1) Various 2) Gas in x-ray tube	Continue the exam, but: 1) if fault recurs immediately, stop exam & call field service 2) if fault recurs intermittently, record all occurrences and call field service

Note: Remove the APR disk after completing the APR revision.

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12-2-3 Audio Message

In order to assure safe data saving, an audio message of -Bi- Bi- Bi- sounds when retrieve data from floppy disk.

During X-ray emission an audio message sounds.

12-2-4 Generator Error Codes

Table 12-2
GENERATOR ERROR CODE

Error Code	Meanings
Err 30	Tube Spits error
Err 40	Rotation error
Err 50	Heater (filament) error
Err:60	Exposure error
Err 70	Power supply error
Err 80	Hardware error
Err 90	Software error
Err100	System Comminication error
Err 110	Tube/generator overheat error
Err 120	Application error

12- 3 Other Operator Fault Analysis

TABLE 12-3
OPERATOR FAULT ANALYSIS

Fault	Recommended Action
System circuit breaker on and LCD display is dark.	Verify: – Power line is plugged into the receptacle or connected to the main circuit breaker? – Power is available at the receptacle or the main circuit breaker? – The remote ON/OFF switch on the System Console is in the **ON** position?
No exposure.	Are any error messages displayed?
Image quality.	– Motion artifacts? Relax the patient. Make the patient as comfortable as possible. Check once again for proper positioning. – Insufficient contrast? Decrease kVp. Check the dark room, film expiration date, chemicals and developer temperature.
Fault Reset (AEC).	Verify: – Proper chamber selected? – Chamber connected? – Film speed correct? If the film is too dark, decrease density. If the film is too light, increase density.

12- 4 Resetting Faults

When AEC mode is enabled, exposure time/termination is controlled via ionization chamber sensing circuits. In addition, a back-up time is programmed into the system to help prevent excessive patient dose in the event of an AEC system malfunction. If the exposure time equals the back-up time, exposure will be terminated and a fault message will appear across the bottom of the screen. To clear the fault, press the function key by the flashing **FAULT RESET** field. If the fault persists, the system should be used in manual mode until the fault can be isolated/corrected.

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CHAPTER 13 PHYSICAL REQUIREMENTS OF ROOM

13-1 Environmental Requirements/Limitations

13-1-1 Room Climate

Relative humidity and temperature

See Table 13-1. To obtain relative humidity and temperature requirements for components

TABLE 13-1
CLIMATE REQUIREMENT (BY COMPONENT) - RELATIVE HUMIDITY AND TEMPERATURE

PRODUCT OR COMPONENT	RELATIVE HUMIDITY				TEMPERATURE			
	IN-USE		STORAGE		IN-USE		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Elevating table	10%	75%	5%	95%	+10°C	40°C	-20°C	+70°C
OTS	10%	75%	5%	95%	+10°C	40°C	-20°C	+70°C
Generator	10%	75%	5%	95%	+10°C	40°C	-20°C	+70°C
System Console	10%	75%	5%	95%	+10°C	40°C	-20°C	+70°C
Tomolink Option	10%	75%	5%	95%	+10°C	40°C	-20°C	+70°C
X-ray Tube (Rad 14)	10%	75%	5%	95%	+10°C	40°C	-20°C	+70°C
X-ray Tube (MX 100)	10%	80%	5%	95%	0°C	40°C	-40°C	+80°C
SG120 Wallstand	20%	85%	10%	95%	+10°C	40°C	-20°C	+70°C

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Altitude and Atmospheric Pressure

See Table 13-2.

TABLE 13-2
ALTITUDE AND ATMOSPHERIC PRESSURE

PRODUCT OR COMPONENT	ALTITUDE				ATMOSPHERIC PRESSURE			
	IN-USE		STORAGE		IN-USE		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Elevating table	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	3048 m (10000 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa
XT OTS	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	3048 m (10000 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa
Generator	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	3048 m (10000 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa
PDU	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	3048 m (10000 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa
System Console	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	3048 m (10000 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa
Tomography Option	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	3048 m (10000 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa
X-ray Tube (Rad 14)	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	3048 m (10000 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa
X-ray Tube (MX 100)	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	6096 m (20000 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa
SG120 Wallstand	-30.5 m (-100 ft.)	2440 m (8005 ft.)	-30.5 m (-100 ft.)	3000 m (9842 ft.)	650 hPa	1060 hPa	500 hPa	1060 hPa

13-2 Equipment Heat output (Dissipation)

See Table 13-3.

TABLE 13-3
HEAT OUTPUTS (BY COMPONENT)

PRODUCT OR COMPONENT	MAXIMUM HEAT OUTPUT (BTU/hr)	MAXIMUM HEAT OUTPUT (WATTS)
	IN-USE	IN-USE
Table Assembly	1500	500
Generator	2036	597
PDU	500	145
Console	180	60
X-ray Tube (Rad 14)	2288	671
X-ray Tube (MX 100)	3600KHU/hr	740

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13-3 Radiation Protection

Because X-ray equipment produces radiation, special precautions may need to be taken or special site modifications may be required. The General Electric Company does not make recommendations regarding radiation protection. It is the purchaser's responsibility to consult a radiation physicist for advice on radiation protection in X-ray rooms.

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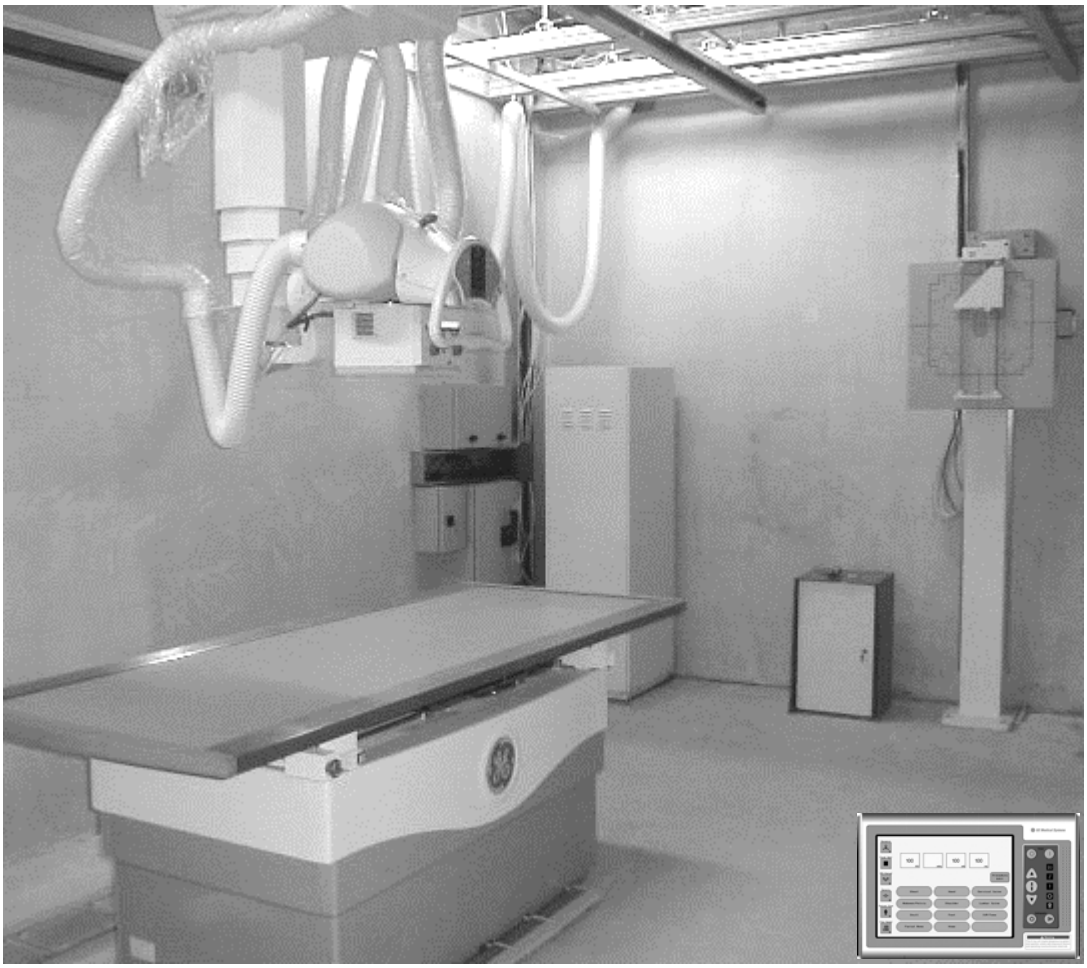
CHAPTER 14 SPECIFICATIONS

14-1 General System Specifications

ILLUSTRATION 14-1
PROTEUS XR/A SYSTEM COMPONENTS



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14- 2 Table Specifications

See Table 14-1 for Table Specifications.

See Table 14-2 for Table Bucky Specifications.

TABLE 14-1
TABLE SPECIFICATIONS

Parameter	**Elevating Tables**
Table Top Length	2174.5 mm
Table Top Width	685.5 mm
Height	500±10mm ~ 800±10mm Elevating
Table Top Longitudinal Travel	+/-390±10mm
Table Top Transverse Travel	+/-116±10mm
Table Top Operating Force	<49N
Table Top Detent Force	>150N
Vertical Travel Speed (50Hz)	42±5mm/s
Vertical Travel Speed (60Hz)	52±5mm/s
Travel Stopping Distance	<10mm
Down motion prohibit Force	20±2kg
Table top Load (Max.)	220 kg
Table Top Filtration	<1.0 mm Aluminium equivalency at 100 kVp
Table Top to Film Distance (For Bucky)	<=76mm
Table Weight	250 kg
Power Supply	220+/-10%VAC, 50Hz/60Hz, 5Amp

TABLE 14-2
TABLE BUCKY SPECIFICATIONS

Parameter	**Specification**
Longitudinal Travel in Table	590±10mm
Grid Size	438mm×479.5mm
Grid	36line/cm; 12:1 ratio; 100 cm focus
Cassette Size Sensing	18 cm (7 in.) minimum to 43 cm (17 in.) maximum

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14- 3 Generator Specifications

The Proteus XR/a generator is available in four three-phase models (32 kW, 50 kW, 65kW and 80kW).

14-3-1 Generator Cabinet Specifications

See Illustration 14-2 and Table 14-3.

ILLUSTRATION 14-2
PROTEUS XR/a GENERATOR CABINET

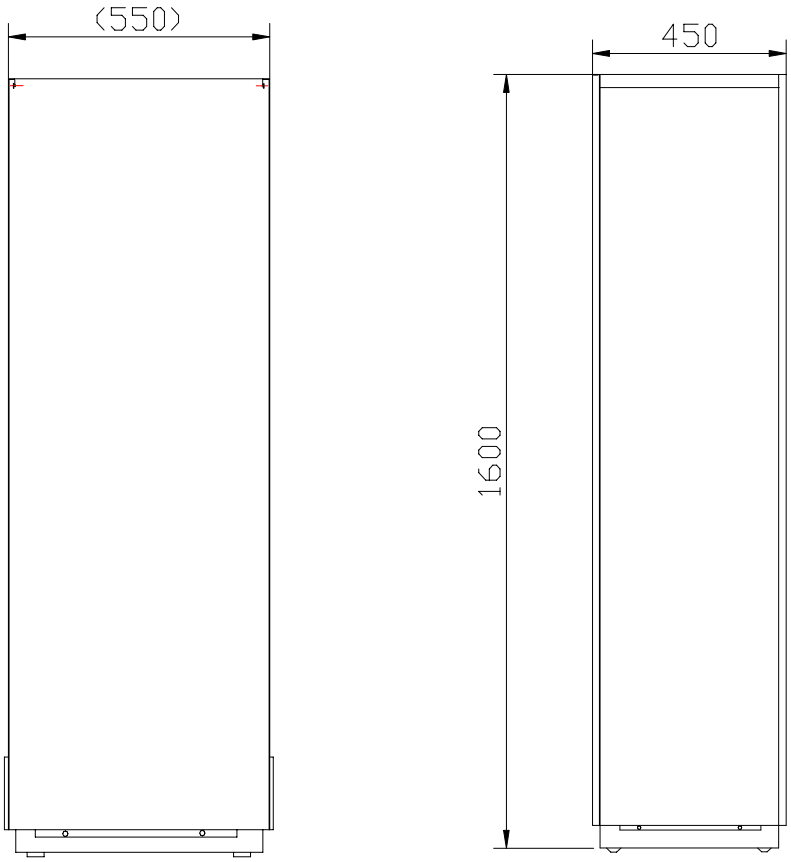

TABLE 14-3
GENERAL CABINET SPECIFICATIONS

Dimensions	Generator Cabinet
Height:	1600 mm
Width:	550 mm
Depth:	450 mm
Weight:	150kg

Note: ***All specifications do not include measurement instrumentation accuracy.***

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14-3-2 General Input Power Specifications

TABLE 14-4
MODEL DEPENDENT SPECIFICATIONS

PARAMETER	JEDI GENERATOR
Input Voltage	380/400/415/440/460/480VAC three phase and Ground without neutral
Daily Voltage Variations	+/-10% (in this range, the generator shall operate without any derating in accuracy)
Line Impedance Specification	IEC Specification
Line Impedance	The apparent line impedance guaranteed by the customer should be equal or less than the values indicated below, according to the voltage value and the commercial power of the generator Voltage range(V) line impedance (Ohms) (3 phase) 32kW 50kW 65kW 80kW 380 0.25 0.15 0.12 0.09 415 0.30 0.18 0.14 0.11 440 0.34 0.20 0.15 0.125 480 0.40 0.24 0.18 0.15
HV cable type	IB EEC: 22mm cable de Lyon (<=150pF/m) USA: 22mm DSI (<=165pF/m) EEC: 16mm Claymount (<=165pF/m) HV cable connector =Federal standard
Ground Wire	Same as power cable
Inrush Current	1000A
Normal Frequency	50/60Hz
Daily Frequency Variation	+/-6%

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14-3-3 Generator Output Power:

TABLE 14-5
PROTEUS XR/A GENERATOR POWER

kV	32kW	50kW	65kW	80kW
40-80	400mA	630mA	800 mA	1000 mA
100	320mA	500mA	630 mA	800 mA
125	250mA	400mA	500 mA	630 mA
150	200mA	320mA	400 mA	500 mA

The Proteus XR/a can deliver the power specified in this output for at least 100ms, depending on the X-ray tube used. Refer to the tube rating charts supplied with the x-ray tube.

In accordance with IEC requirements, Table 14-7 defines the reference Current Time Product.

TABLE 14-6
NOMINAL ELECTRIC POWER (100kV-0.1S):

KW k	32	50	65	80
I (max) mA	320	500	630	800

TABLE 14-7
PARAMETER SELECTION RANGES OF CONSOLE READOUTS

	All Modes	
Selectable kV	40-150	
Decimal scale	steps of 1kV	Jump of 10kV
Renard scale	40,41,42,44,46,48,50,52, 55,57,60,63,66,70,73,77, 81,85,90,96,102,109,117, 125,133,141,150	The next kV displayed is the third Renard step value following the initial display value of kV.

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TABLE 14-8
ACCURACY READINGS ON CONSOLE READOUTS

Mode : 3 point			
Selectable		Resultant	
mA 26%	ms 26%	mAs 26% increments	
Proteus XR/a 32 kW: 17steps(10,12.5,16,20,25,32,40,50,63,80,100,125,160,200,250,320,400mA)	1 thru 630ms 39steps	Non-AEC	0.5 thru 630mAs 32 steps
Proteus XR/a 50 kW: 19steps(10,12.5,16,20,25,32,40,50,63,80,100,125,160,200,250,320,400,500,630mA)	1 thru 630ms 39steps	AEC	0.5 thru 630mAs 32 steps
Proteus XR/a 65 kW: 20steps(10,12.5,16,20,25,32,40,50,63,80,100,125,160,200,250,320,400,500,630,800mA)	1 thru 630ms 39steps		
Proteus XR/a 80 kW: 21steps(10,12.5,16,20,25,32,40,50,63,80,100,125,160,200,250,320,400,500,630,800,1000mA)	1 thru 630ms 39steps		

		Auto Exposure Control: AEC			
AEC	Technique	Sensing Device	Sensing area	Manual density correction	Post-display: Automatic for 5sec
AEC	Cassette	Ionization Chamber:up to 2	3 rectangular cells	5 steps, -2thru +2, by 26% increment	mAs, ms and mA

Mode: 2 point	
User Selectable	
	MAs 26% increments
Non-AEC	32 steps (0.5,0.63,0.8,1.0,1.25,1.6,2.0,2.5,3.2,4.0,5.0,6.3,8.0,10.0, 12.5,16.0,20.0,25.0,32.0,40.0,50.0,63.0,80.0,100.0,125.0, 160.0,200.0,250.0,320.0, 400.0,500.0, 630.0mAs)
AEC	31 steps (0.5,0.63,0.8,1.0,1.25,1.6,2.0,2.5,3.2,4.0,5.0,6.3,8.0,10.0, 12.5,16.0,20.0,25.0,32.0,40.0,50.0,63.0,80.0,100.0,125.0, 160.0,200.0,250.0,320.0, 400.0,500.0mAs)

Note: ***Only when the AEC exposure time is more than 5ms, the density target offset can be ensured less than +/-15%.***

Constancy of AIR KERMA
Nominal Shortest Irradiation Time:
80kV, 10ms – without correction
80kV, 7ms – with correction by HV Generator.

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TABLE 14-9
ACCURACY OF CONSOLE READOUTS

Note: ***In RAD mode, kVp accuracy is ensured after 10ms.***

	Displayed before exposure		
Conditions	parameter	mode	Basic Accuracy
Radiography Exposure Time < = 40 ms	kVp	all	+/- (3%, + 2 kVp)
	mA	all	+/- (10%, + 1 mA)
	ms	3 point timer	+/- (5%, + 0.5ms)
	mAs	2 point	+/- (5%, + 0.1 mAs)
	ms	AEC (2/3 point)	+/- 5%
	mAs	AEC (2/3 point)	+/- 10%
	mA	AEC (3 point)	+/- 15%
Radiography Exposure Time > 40 ms	mA	all	+/- (5%, + 1 mA)
	ms	3 point timer	+/- (5%, + 0.5ms)
	mAs	2 point	+/- (5%, + 0.1 mA)s
	ms	AEC (2/3 point)	+/- 5%
	mAs	AEC (2/3 point)	+/- (5%, + 0.1 mAs)
	mA	AEC (3 point)	+/- 10%

14-3-4 Power Line Requirements

See Table 14-10 for 32 kW Three Phase Generators.
See Table 14-12 for 50 kW Three Phase Generators.
See Table 14-14 for 65 kW Three Phase Generators.
See Table 14-16 for 80 kW Three Phase Generators.

TABLE 14-10
MINIMUM WIRE SIZE (32 kW)

PARAMATER	**THREE PHASE GENERATOR - 32KW**											
Input Voltage	**380VAC**		**400 VAC**		**415 VAC**		**440 VAC**		**460 VAC**		**480 VAC**	
Wire Size Length												
15 m (50 ft.)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)
30 m (100 ft.)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)
46 m (150 ft.)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)
60 m (200 ft.)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)

TABLE 14-11
KVA LOAD CHARACTERISTICS 32KW

Phase	3	3	3	3	3	3
Nominal line Voltage(Vac)	380	400	420	440	460	480
Voltage range(Vac)	+/–10%	+/–10%	+/–10%	+/–10%	+/–10%	+/–10%
Momentary line current(Amp)	70	66	63	60	58	55
Continuous line current(Amp)	7	6.7	6.2	6	5.7	5.5
Power demand(kVA)	46	46	46	46	46	46
Frequency	47 /53Hz and 57/63Hz					

TABLE 14-12
MINIMUM WIRE SIZE (50 kW)

PARAMATER	**THREE PHASE GENERATOR - 50KW**											
Input Voltage	**380VAC**		**400 VAC**		**415 VAC**		**440 VAC**		**460 VAC**		**480 VAC**	
Wire Size Length												
15 m (50 ft.)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)	10 mm2	(#8 AWG)
30 m (100 ft.)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)	16 mm2	(#6 AWG)
46 m (150 ft.)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)	22 mm2	(#5 AWG)
60 m (200 ft.)	30 mm2	(#3 AWG)	30 mm2	(#3 AWG)	30 mm2	(#3 AWG)	30 mm2	(#3 AWG)	30 mm2	(#3 AWG)	30 mm2	(#3 AWG)

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TABLE 14-13
KVA LOAD CHARACTERISTICS 50KW

Phase	3	3	3	3	3	3
Nominal line Voltage(Vac)	380	400	420	440	460	480
Voltage range(Vac)	+/–10%	+/–10%	+/–10%	+/–10%	+/–10%	+/–10%
Momentary line current(Amp)	110	105	100	95	92	88
Continuous line current(Amp)	7	6.7	6.2	6	5.7	5.5
Power demand(kVA)	70	70	70	70	70	70
Frequency	47 /53Hz and 57/63Hz					

TABLE 14-14
MINIMUM WIRE SIZE (65 kW)

PARAMATER	**THREE PHASE GENERATOR - 65KW**											
Input Voltage	**380VAC**		**400 VAC**		**415 VAC**		**440 VAC**		**460 VAC**		**480 VAC**	
Wire Size Length												
15 m (50 ft.)	16 mm^2	(#6 AWG)	16 mm^2	(#6 AWG)	16 mm^2	(#6 AWG)	16 mm^2	(#6 AWG)	16 mm^2	(#6 AWG)	16 mm^2	(#6 AWG)
30 m (100 ft.)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)
46 m (150 ft.)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)
60 m (200 ft.)	44 mm^2	(#1 AWG)	44 mm^2	(#1 AWG)	44 mm^2	(#1 AWG)	44 mm^2	(#1 AWG)	44 mm^2	(#1 AWG)	44 mm^2	(#1 AWG)

TABLE 14-15
KVA LOAD CHARACTERISTICS 65KW

Phase	3	3	3	3	3	3
Nominal line voltage (Vac)	380	400	420	440	460	480
Voltage range (Vac)	+/–10%	+/–10%	+/–10%	+/–10%	+/–10%	+/–10%
Momentary line current (Amp)	147	140	133	127	122	117
Continuous line current (Amp)	7	6.7	6.2	6	5.7	5.5
Power demand (kVA)	97	97	97	97	97	97
Frequency	47 /53Hz and 57/63Hz					

TABLE 14-16
MINIMUM WIRE SIZE (80 kW)

PARAMATER	**THREE PHASE GENERATOR - 80KW**											
Input Voltage	**380VAC**		**400 VAC**		**415 VAC**		**440 VAC**		**460 VAC**		**480 VAC**	
Wire Size Length												
15 m (50 ft.)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)	22 mm^2	(#5 AWG)
30 m (100 ft.)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)	30 mm^2	(#3 AWG)
46 m (150 ft.)	43 mm^2	(#1 AWG)	43 mm^2	(#1 AWG)	43 mm^2	(#1 AWG)	43 mm^2	(#1 AWG)	43 mm^2	(#1 AWG)	43 mm^2	(#1 AWG)
60 m (200 ft.)	54 mm^2	(#0 AWG)	54 mm^2	(#0 AWG)	54 mm^2	(#0 AWG)	54 mm^2	(#0 AWG)	54 mm^2	(#0 AWG)	54 mm^2	(#0 AWG)

TABLE 14-17
KVA LOAD CHARACTERISTICS 80KW

Phase	3	3	3	3	3	3
Nominal line Voltage (Vac)	380	400	420	440	460	480
Voltage range (Vac)	+/–10%	+/–10%	+/–10%	+/–10%	+/–10%	+/–10%
Momentary line current (Amp)	190	180	170	163	156	150
Continuous line current (Amp)	7	6.7	6.2	6	5.7	5.5
Power demand (kVA)	125	125	125	125	125	125
Frequency	47 /53Hz and 57/63Hz					

Note: ***Wire size from Distribution Transformer to Disconnect Switch. Voltage is three-phase measured line to line, balanced to neutral.***

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14-3-5 PDU Output Power

See Table 14-18 for PDU output power

TABLE 14-18
PDU OUTPUT POWER

To Wall Stand (GPCP No. 2260354):	31VDC+/-15% 1.5A
To SG120 Wall Stand (GPCP No.: 2402562)	115, 230 V+/- 10% 50/60 Hz
To System IF board:	+12VDC 5A -12VDC 1A +5VDC 5A
To RAD IF :	230VAC+/-10% 1A 50/60HZ
To table:	220VAC 8A 50/60Hz 240VAC 5A 50/60Hz
To overhead tube suspension:	110VAC+/-10% 5A 50/60Hz
To system console:	12VDC+/-5% 5A
To generator:	380-480VAC 50/60Hz 46kVA@ 32kW 70kVA@ 50kW 97kVA@ 65kW 125kVA@ 80kW

14-3-6 X-ray Interlock Systems

"Deadman's Switch" X-ray Control Safety System

X-ray emission is terminated instantly when you release the x-ray control radiography pushbutton.

A special safety circuit uses a signal from second trigger (radiographic exposure) controls transmitted directly via relay contacts to the control circuit of the power inverter. If the microprocessor does not stop x-ray emission after a delay of several milliseconds, inverter operation is inhibited. In this case, a fault signal is sent to the control circuits of the generator.

X-ray Tube Housing Overheat Interlock

If the factory-adjusted temperature of the tube housing goes higher than the permissible level, x-ray emission is terminated.

If it occurs, ask the service Refer to troubleshooting chart.

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14- 4 System Console Specifications

See Table 14-19

TABLE 14-19
GENERAL SPECIFICATIONS

Dimensions	**System Console**
Long:	350 mm (13-3/4 in.)
Width:	230 mm (9 in.)
Depth:	60 mm (2-1/2 in.)
Weight:	8 kg (17-1/2 lbs.) (with pedestal)
Touch Screen	10.4”
Floppy Drive	1.44MB
APR	1728 programmable
Power Supply	
System Console	12VDC, 5Amps

14- 5 OTS Specifications

See Table 14-20.

TABLE 14-20
OTS SPECIFICATIONS

Parameter	**Specification**	
Longitudinal Focal Spot Travel	2640mm to 5020mm	
Lateral Focal Spot Travel	1200mm@2m bridge 2100mm@3m bridge	
Vertical Focal Spot Travel	1500 mm (59 in.)	
Horizontal Tube Rotation	+/- 180 degrees; detents at each 90 degree position	
Vertical Tube Rotation	+ 25/-10 degrees	
Focal Spot to Ceiling Distance (Horizontal)	Min 733mm (28-7/8 in.)	Max 2232mm (87-7/8 in.)
Focal Spot to Ceiling Distance (Vertical)	Min 713mm (28-1/16 in.)	Max 2211mm (87-1/16 in.)
Distance between Center Lines of Ceiling Mounting Bolt Holes in Stationary rails	1.43m(56”), or 1.27m(50”), or 1.22m(48”)	
Extension	190mm, 287mm	
OTS RAD Suspension Weight	431kg (50lbs)	
Stationary rail length	3470mm to 5790mm	
OTS Console		
kV Control and Display	40–150	
mAs Control and Display	0.5–630	
SID Display	0–200	
Tube Angle Display	–180 to +180	
Power Supply		
OTS Console	+5VDC, 2.5A	
	+12VDC, A	
	- 12VDC, A	

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14- 6 Collimator Specifications

14-6-1 PROTEUS XR/a Automatic Collimator

See Table 14-21.

TABLE 14-21
AUTOMATIC COLLIAMTOR ELECTRICAL SPECIFICATIONS

Parameter	Specification
Multileaf collimator	Digital version with automatic formats collimation system and light localizer for rectangular collimation with linear light localizer and rails for secondary filters
Operation mode	Automatic Manual
Maximum field size	50 cm x 50 cm with a 1.0 m SID
Smallest field size	3.0cm x 3.0 cm with a 1.0 m SID
Angle of rotation	±180° around central beam axis (Detent: 90 degree)
Aperture angle	28° / 28°
SID tape measure	Yes
Indication marked	100/150/180cm
Collimation	data for SID=100cm
Positioning Accuracy	<1.2% of the SID
Radiological Properties	
Inherent Filtration	1.0 mmAl with 75 KV
Light Localizer	
Light Field Accuracy	Light field to X-Ray field alignment within 10mm.
Brightness	>160 lux@100cm
Centering indication	Shadow crosshair 3x3cm to 50x50cm
Bucky centering laser light	Yes
Mounting	Attaches directly to tube units listed in generator tube compatibility list.
Panel Lights	Color-coded: Manual/amber, Exposure Hold/red, Ready/green.
Power Requirements	
Projection Lamp	Only OEM Siemens lamps may be used as replacement parts! 24 V / 150 W / part no.: 8375545 G2107
Lamp Timer	30 seconds (27 - 33 sec.)
Collimator Power Supply	24 - 30VDC (±10%) /2A
Light Localizer Power Supply	28 - 40VAC (±10%) /7A
CAN Interface Power Supply	12VDC (±10%) /150mA
Ambient conditions (operation)	Temperature range + 10°C to +40°C Rel. humidity: 20 % to 75 %, non-condensing Barometric pressure: 70 kPa to 106 kPa
Transport conditions	Temperature range - 40°C to +70°C Rel. humidity: 10 % to 95 %, non-condensing Barometric pressure: 70 kPa to 106 kPa

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14-6-2 Proteus XR/a Manual Collimator

See Table 14-22.

TABLE 14-22
MANUAL COLLIMATOR ELECTRICAL SPECIFICATIONS

Parameter	Specification
Additional prefilter	0, 0.1, 0.2, 0.3 mm Cu
Operation mode	Manual
Radiological Properties	
Inherent Filtration	1.0 mm Al with 75 kV
Radiation shielding	Max. 150kV
Leakage radiation	<50 mR/h (at 150kV/3mA, 1m distance from tube ass.)
Maintenance	Maintenance free
Light Localizer Power Supply	28 - 40VDC (±10%) / 10A
Mechanical interfaces	
Flange to the tube assembly	Diameter: 136mm Thickness: 2mm
Source flange distance	80mm
Accessory rails	Number: 2 Width: 178mm Length: 178mm Height of the guide: 2mm
Quality standards	CE, UL, CSA, DHHS
Ambient conditions	Temperature range 10°C to 40°C Rel. humidity: 20 % to 75 %, non-condensing Barometric pressure: 70 kPa to 106 kPa

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14-6-3 Eclipse Proteus Collimator Specifications

TABLE 14-23
ECLIPSE PROTEUS COLLIAMTOR ELECTRICAL SPECIFICATIONS

Description	Specification
Dimensions (L x W x H) [mm]	330 x 210 x 180
Weight [kg]	10 ± 0,5
Angle of rotation around central beam axis [°]	± 90
Maximum FOV [cm] @ SID = 100cm	50 x 50
Minimum FOV [cm] @ SID = 180cm	4.5 x 4.5
Power supply: DC input voltage [V]	24 ± 10%
Max. DC input current [A]	2
AC input voltage [V]	37 ± 10%
Max. AC input current [A]	7
Lamp type	Philips 12999: 12v, 50W
Temperature: Operation [°C]	5 ≤ T ≤ 40
Transport and storage [°C]	-40 ≤ T ≤ 70
Humidity: Operation [%]	10 ≤ T ≤ 90, non-condensing
Storage [%]	5 ≤ T ≤ 95, non-condensing
Pressure: Operation [hPa]	650≤ T ≤ 1013
Storage [hPa]	525 ≤ T ≤ 1013
Inherent filtration	1,0 mm Al at 70 kV
Leakage radiation	< 0,5 mGy/ h
Rectangular blade positioning accuracy	±2mm@SID=1m
Rectangular blade positioning repeatability	±1mm@SID=1m

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14- 7 Wall Stand (GPCP No.: 2260354) Specifications

See Table 14-24, 14-25

TABLE 14-24
WALL STAND SPECIFICATIONS

Parameter	Specification
Weight	100 kg (220 lbs.)
Vertical Travel (Film Centerline)	1310 mm (52-1/3 in.)
Vertical Travel (Centerline Minimum to Maximum)	460 mm to 1770 mm
Grid Holding Force	>196N
Wall stand panel Filtration	0.6mm Aluminium equivalency at 100 kVp
Bucky Loading	Left hand or Right hand
Cassette Load	Right Hand (Left hand load field configurable)
Power Supply	31VDC+/-15%, 1.5Amp
Object to film distance	55mm
Panel to column distance (with/without knee spacer)	500mm/167mm

TABLE 14-25
WALL STAND BUCKY SPECIFICATIONS

Parameter	Specification
Grid Size	438mm×479.5mm
Grid	43line/cm; 10:1 ratio; 150 cm focus
Cassette Size Sensing	18 cm (7 in.) minimum to 43 cm (17 in.) maximum

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14- 8 SG120 Wall Stand (GPCP No.: 2402562) Specifications

See Table 14-26, 14-27.

TABLE 14-26
SG120 WALL STAND SPECIFICATIONS

Parameter	Specification
Weight	220kg (485.1 lbs)
Height	2235 mm (87.99 in)
Min. Width	652 mm (25.67 in)
Max. Width	915 mm (36.02 in)
Min. Depth	687 mm (27.05 in)
Max. Depth	927 mm (36.5 in)
Front panel height	64.2 cm (25.2 in)
Front panel width	65 cm (25.6 in)
Distance Front Panel to Film Plane	5.8 cm (2.28 in)
Min. Height (Bucky vertical)	33 cm (13.1 in)
Max. Height (Bucky vertical)	190.5 cm (75 in)
Min. Height (Bucky horizontal)	63.5 cm (25 in)
Max. Height (Bucky horizontal)	213 cm (83.9 in)
Bucky rotation range	0° to 180°
Bucky Angulation range	–20° to 90°.
Grid Holding Force	>196N
Wall stand panel Filtration	Maximum 0.65 Al equivalency at 100 kVp
Bucky Loading	Left hand or Right hand
Cassette Load	Left Hand (Right hand load field configurable)
Power Supply	Single phase voltage: 115, 230V+/-10%+ground
Line Frequency	50/60 Hz
Max. Current (Moment.)	0.4
Max. Current (Contin.)	0.2
Panel to front column distance	550 mm (21.65 in)
Panel to front cover distance	483 mm (19.01 in)

TABLE 14-27
SG120 WALL STAND BUCKY SPECIFICATIONS

Parameter	Specification
Grid	36L/cm; 130/180 cm focus
Cassette Size Sensing	13 cm×18 cm (5 in.×7 in.) minimum to 35 cm×43 cm (14 in.×17 in.) maximum

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14- 9 X-ray Tube Specifications

Compliance of Power Unit with the requirement of 50.102 and 50.103 Tube list:

- Varian Tube
  - RAD 14
- Koushal Tube
  - MX 100

14-9-1 VARIAN RAD-14 X-Ray Tube Specifications

The VARIAN RAD-14 X-Ray Tube is used in Three-Phase 50 kW systems. See Table 14-28.

TABLE 14-28
VARIAN RAD-14 X-RAY TUBE SPECIFICATIONS

Parameter	**Specification**
Rotating Anode	Rad-14: 3450 rpm (low); 10000rpm (high);
kVp Capacity	150 kVp
Large Focus	1.2 mm, 75kW, 630mA
Small Focus	0.6 mm, 27kW, 200mA
Target Angle	12 °
Access Time	
Transition 0→LS	1.2s
Transition LS →0	3s/70Vdc Brake
Tube Protection	
Cooling Type	Natural
Anode Thermal Capacitance	212 kJ
Housing Thermal Capacitance	930 kJ
Housing Cooling Rate	180 W
The maximum x-ray tube loading power	150kV, 4320mAs per hour
Maximum tube housing temperature	71±15°
Insert Filtration	1.6 mm Aluminium equivalency at 100kVp

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14-9-2 MX 100 Tube Specifications

The MX 100 X-Ray Tube is used in Three-Phase 65 or 80 kW systems. See Table 14-29.

TABLE 14-29
MX 100 X-RAY TUBE SPECIFICATIONS

Parameter	Specification
Rotating Anode	3000/3600 and 9000/10800rpm
kVp Capacity	150 kVp
Large Focus	1.25mm, 100kW, 1000mA
Small Focus	0.6 mm, 36kW, 400mA
Target Angle	12.5 °
Acces Time	
Transition 0→LS	1.2s
Transition LS →0	3s/70Vdc Brake
Tube Protection	
Cooling Type	Air Blower
Anode Thermal Capacitance	260 kJ
Housing Thermal Capacitance	1110 kJ
Housing Cooling Rate	740W Max average power
The maximum x-ray tube loading power	150KV, 5184mAs per hour
Maximum tube housing temperature	71±15°
Insert Filtration	0.8 mm Aluminium equivalency at 150kVp
Small Focal spot Nominal value	0.6 (Specifications as per IEC)
Large Focal spot Nominal value	1.25 (Specifications as per IEC)
Continuous Mean Power	740 Watts (600X Ray Watts + accessories)
Radiographic ratings	96kW for large filament and 32kW for Small filament
Noise	55dB @ 1 meter
Radiation containment	50 mR/h
Tube Life	B10= 6.7 months, B50= 36.1 months and DOA: 3%
kV operating range	40-150kV
Target angle	12.5 Degrees
Weight	29.5kg +/- 2.25kg
HV Stability	0 Spits during Functional Test
Safety circuit	Normally closed pressure switch.
Maximum voltage Anode or Cathode to ground	82kVp
Anode Heat storage capacity	260kJ
Tube unit heat storage capacity	1110kJ
Anode Heat dissipation rate	75 kHU per minute
Tube unit heat dissipation rate	60 kHU per minute, with Blower operating
Frame	Glass
Rotation speed	50/60 Hz and 150/180Hz
Anode Diameter	100mm
Target material	Tungsten/ Rhenium
Cooling	Air Blower, 740W Max average power.

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14- 10 Printer Specifications

TABLE 14-30
EPSON MODEL-180 PRINTER SPECIFICATIONS

Printing Method	Impact dot matrix printer (6 print solenoids)
Print Format	
Number of Total Dots	Max. 144 dots/1 dot line
Number of Column	Max. 24 columns (in case of 5x7 dot matrix and 1 dot column space)
Print Speed	
1 Dot Line	Typ. 75ms (continuous printing, 4.8VDC, 25°C)
5x7 Dot Matrix (3 dots line space)	Typ. 1.7l/s (continuous printing, 4.8VDC, 25°C)
Character Size	
Dot Pitch	Horizontal 0.33mm Vertical 0.37mm
5x7 Dot Matrix	1.7(W)×2.6(H) mm
Copy Capacity	1(original)+1(copy) (in the case of conform to specifications for pressure sensitive paper M-180 series)
Paper	57.5mm width wood free paper or specified pressure sensitive paper
Paper Feed	Paper is fed automatically per 1 dot line. Fast paper feeding is possible. (Typ. 4.0l/s at 4.8VDC, 25°C, continuous printing) With paper free mechanism and manual paper feed knob
Inking	Ribbon cassette (ERC-09 or ERC-22). Ribbon is fed automatically during motor revolution.
Motor	
Terminal Voltage	4.8+0.7/-1.0 VDC
Mean Current	Typ. 0.2A (4.8VDC, 25°C, the value measured by the ammeter)
Timing Detector	Tachometer-Generator (directly connected with motor)
Reset Detector	Reed switch
Print Solenoid	
Terminal Voltage	4.8+0.7/-1.5 VDC.
DC Resistance	1.5 ohms +/-10% (at 25°C)
Fast Paper Feed Trigger Magnet	
Terminal Voltage	4.8+0.7/-1.0 VDC (The difference between motor terminal voltage and it should be 1V or less.)
DC Resistance	20 ohms +/-10% (at 25°C)
Connection	
Printer Side	P.C. board with 2.54mm pitch copper leaf pattern that is fixed on printer frame.
Circuit Side	Cable wires or lead wires
Operating Ambient Temperature	0°C to 50°C
Reliability	MCBF 1 million lines (In case of printing with print mode in attached table 1)
Dimensions	9.06(w)x4.11(d)x3.75(h) inch (except for a manual paper feed knob)
Weight	250 g +/-10%
DOSE Display Deviation	≤25%

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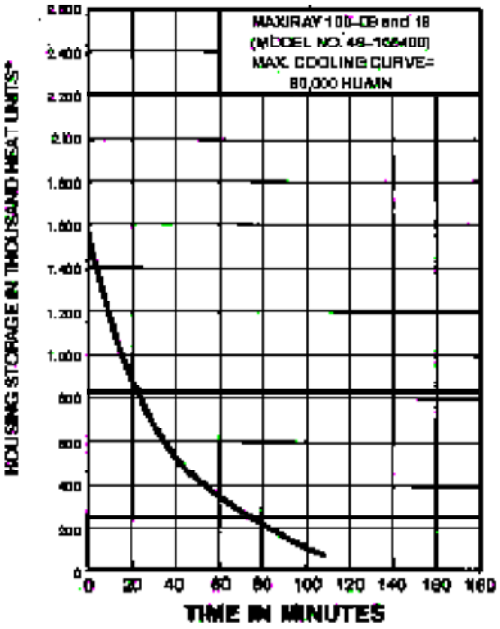
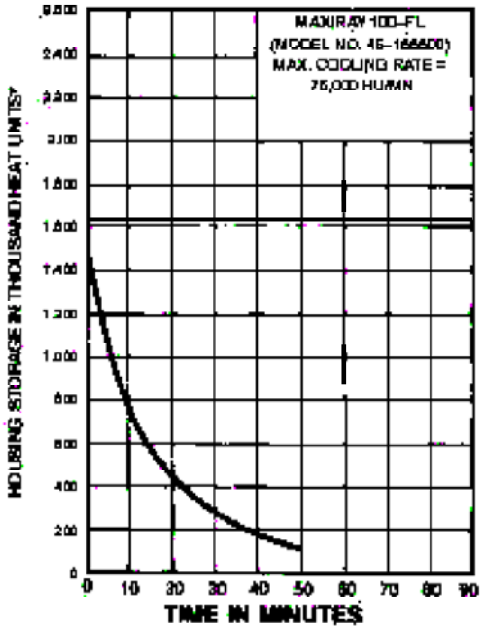
Appendix

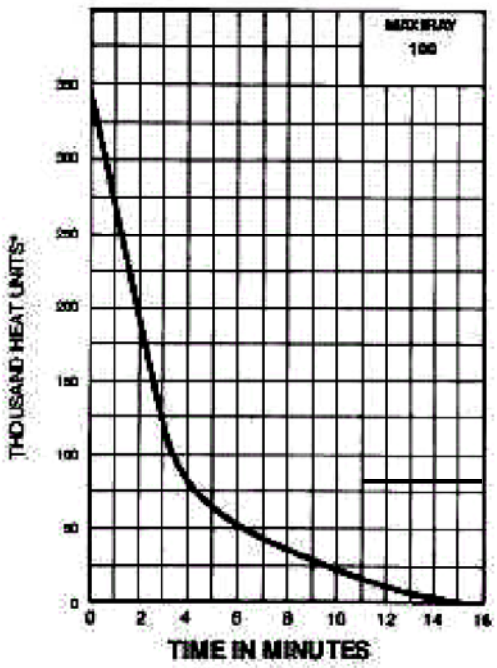
MX100 X-ray tube

Housing Cooling Characteristics

TUBE HOUSING COOLING CURVE


MAXIRAY 100-CB and 18
(MODEL NO. 46-166400)
MAX. COOLING CURVE=
80,000 HU/MIN
HOUSING STORAGE IN THOUSAND HEAT UNITS*
0 20 40 60 80 100 120 140 160 180
TIME IN MINUTES


MAXIRAY 100-FL
(MODEL NO. 46-166400)
MAX. COOLING RATE =
75,000 HU/MIN
HOUSING STORAGE IN THOUSAND HEAT UNITS*
0 10 20 30 40 50 60 70 80 90
TIME IN MINUTES



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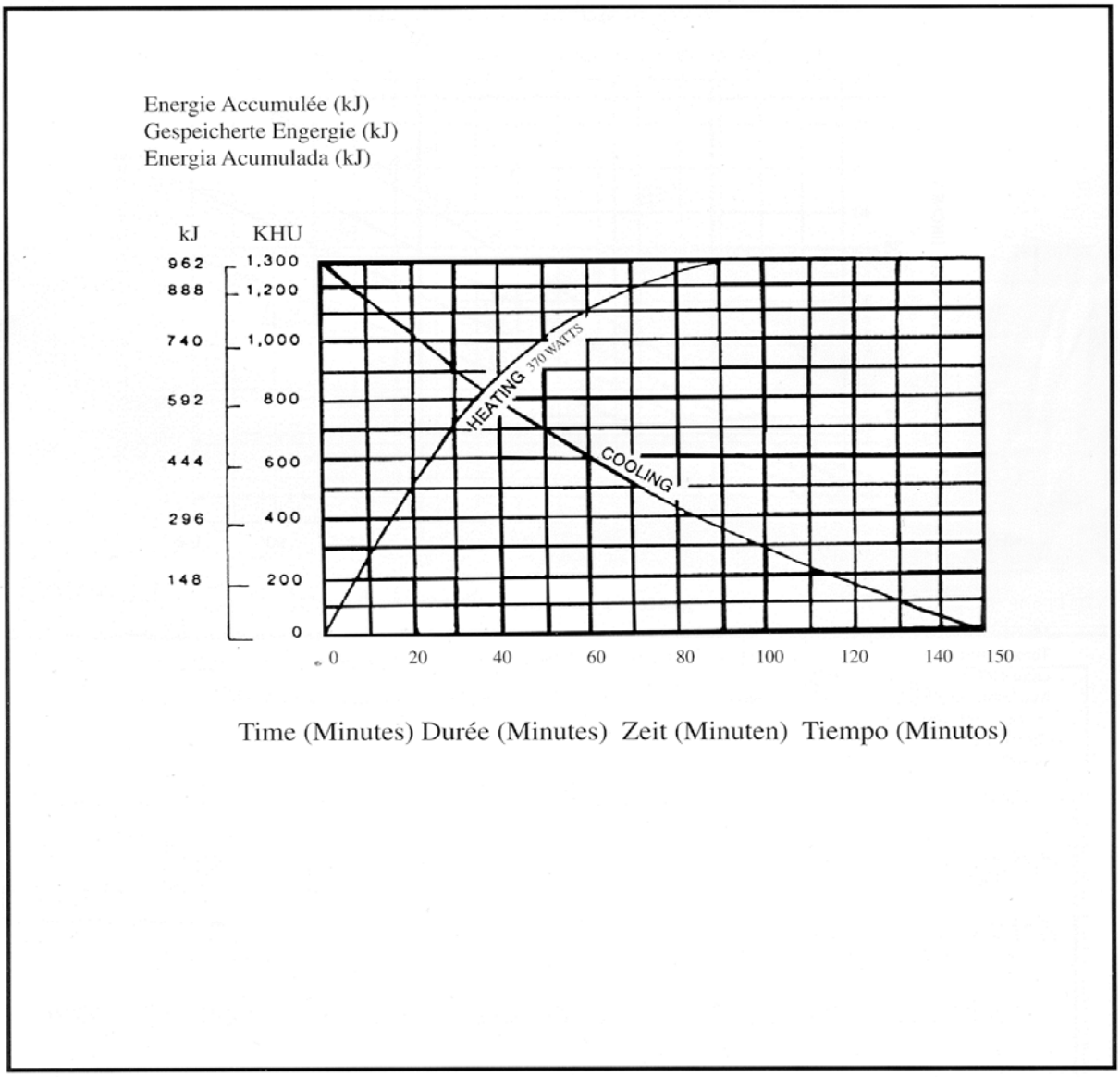
varian
x-ray tube products

Emerald/Diamond Housing
Housing Cooling Characteristics

Caractéristiques de refroidissement de la Gaine
Gehäuseabkühlungscharakteristiken
Caracteristicas de Enfriamiento del Encaje



Note:

Heat inputs into housing include tube power, filament power and stator power. Heating curves based on no restrictions of natural convection around tube housing assembly.

Remarque:

La chaleur introduite dans la gaine tient compte de la puissance du tube, du filament et du stator. Les courbes d'échauffement ne supposent aucune restriction de la convection naturelle autour de la gaine.

Anmerkungen:

Warmezufuhr in das Gehäse schliesst Röhrenstrom, Heizfadenstrom und Statorstrom ein. Heizkurven basieren auf keinerlei Begrenzung der natürlichen Konvektion um die Röhrengehäusebaugruppe.

Nota:

Energia del encaje incluye el poder del Tubo, el poder del filamento y el poder de la bovina. Las cuvas termales no son afectados por el calor natural creado en la parte exterior del encaje.

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